Blacksmith Ecological Restoration Project

Draft

Environmental Impact Statement

Placer and Eldorado County, CA.

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Abstract: An Environmental Impact Statement has been prepared for the Blacksmith Ecological Restoration Project to analyze alternatives for implementation of a variety of vegetation treatments in forest stands to reduce the potential for loss of important ecosystem components to high severity fire behavior on a majority of the landscape and to improve forest health and increase resilience of stands to the adverse effects of insects and diseases. Project activities are proposed on National Forest System Lands on the Eldorado National Forest in Placer and El Dorado Counties, California. Five Alternatives have been developed based on public input and collaborative efforts. The preferred alternative is Alternative 4.

Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. City of Angoon v. Hodel (9th Circuit, l986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

The opportunity to Comment ends 45 days following publication of the notice of availability (NOA) in the Federal Register.

Send Comments to: Send written comments to Lawrence Crabtree c/o Dana Walsh 7600 Wentworth Springs Rd. Georgetown, CA 95634 Attention: Blacksmith Ecological Restoration Project. Comments may also be sent via e-mail to comments-pacificsouthwest-eldorado-georgetown@fs.fed.us, or via facsimile to 530-333-5522 or by hand-delivery to the address above, during normal business hours (Monday – Friday 8:00am to 4:30pm). The acceptable format(s) for electronic comments is: MS Word or Rich Text Format.

Summary

The Eldorado National Forest proposes to treat up to approximately 7,014 acres using a variety of vegetation treatments in forest stands to reduce fire behavior, improve forest health and increase resilience of stands to the adverse effects of uncharacteristic wildfire behavior and insects and diseases, while improving conditions for wildlife and enhancing watershed conditions. Resilience is the ability of forest to survive stress. In its current conditions many areas of the project landscape do not have a capacity to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and responses. For the Mixed Conifer Forests of the Sierra Nevada achieving resilience can be accomplished by restoring stands to a state which is closer to the vegetation conditions created by an active fire regime (North et al, 2009). This project focuses on establishing the appropriate vegetative composition, structure, and pattern, as well as ecological processes necessary to make the forest ecosystem sustainable, resilient and healthy under current, as well as changing, climatic conditions. This project builds on previous Forest Service efforts in the area to implement projects to modify fire behavior and improve forest health.

Beginning in April, 2012, the proposed action was developed using a collaborative approach to try and bring into line the goals for ecological restoration, concern for California spotted owl, and the Forest's ability to implement the project. Research scientists from the University of Minnesota, Pacific Southwest Research Station, and interested members of industry and the environmental community were consulted during the course of several field and office meetings. Prescriptions for treatment were based on the information identified in these collaborative meetings. Further collaborative meetings with research scientist from Pacific Southwest Research Station and interested members of industry and environmental groups were held in January and February of 2013 to clarify issues, areas of common agreement, current research information, and to develop alternatives to the proposed action.

Despite collaborative efforts during proposal development, concerns regarding potential impacts of the proposed action continued to exist. Significant issues included that:

- the proposed action may have negative effects to the California spotted owl population due to proposed treatment in high quality habitat.

- treatment may not be intensive enough to modify wildfire behavior and improve forest health, may not provide long-term habitat, and does not take into account information in Lydersen and North 2012; and
- the project may not be operational;

These issues led the agency to develop alternatives to the proposed action including:

- Alternative 2 - No Action – No activities proposed with this project would take place
- Alternative 3 – Non-commercial – Areas proposed for commercial thinning under the proposed action would be non-commercially treated to meet minimum fuels objectives
- Alternative 4 – Reduced owl impact – would treat areas in a way that provides a very low risk of reducing owl occupancy and use of individual territories
- Alternative 5 – Increased pace and scale - uses information on topographic variation of structure from Lydersen and North 2012 to increase the pace and scale of restoration within the project area.

Effects:

- Completion of this project would increase the resiliency of this landscape to wildfire and insect mortality, protecting valuable forest resources including large, old trees, and reducing potential fragmentation of old forest habitats.
- Significant impacts are not expected to result from implementation of this project on any forest resource, however, this project would result in short term risk of minor adverse effects to some Forest Resources including but not limited to some species of Forest Service Sensitive wildlife and plants, watershed, soils, air quality, and invasive plant spread.

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Chapter 1. Purpose of and Need for Action

Document Structure

The Forest Service has prepared this Environmental Impact Statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

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- **Chapter 1. Purpose and Need for Action:** This chapter briefly describes the proposed action, the need for that action, and other purposes to be achieved by the proposal. This section also details how the Forest Service informed the public of the proposed action and how the public responded.
- **Chapter 2. Alternatives, including the Proposed Action:** This chapter provides a detailed description of the agency's proposed action as well as alternative actions that were developed in response to comments raised by the public during scoping. The end of the chapter includes a summary table comparing the proposed action and alternatives with respect to their environmental impacts.
- **Chapter 3. Affected Environment and Environmental Consequences:** This chapter describes the environmental impacts of the proposed action and alternatives.
- **Chapter 4. Consultation and Coordination:** This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- **Appendices:** The appendices provide more detailed information to support the analyses presented in the environmental impact statement.
- **Index:** The index provides page numbers by document topic.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at Georgetown, CA.

Background

This project area was identified as not in a resilient condition and not meeting or trending toward desired conditions as defined in the 2004 Sierra Nevada Forest Plan Amendment. Based on National and Regional management direction for Ecological Restoration and desired conditions from the Forest Plan a proposal to move stands toward desired conditions was developed based on field review by an interdisciplinary team of resource specialists.

The project area is situated on the Georgetown Ranger District northeast of Georgetown, CA in the vicinity of Ralston Ridge and Nevada Point Ridge, between the middle fork of the American River and the Rubicon River. The legal locations of proposed activities are: Section 1 Township (T) 12 North (N) Range (R) 11 East (E); Sections 5 and 6 T12N R13E; Sections 2 and 11 T13N R12E; Sections 1-4, 10-

12, 14, 22, 24, 25, 27, 28, and 36 T13N R12E; 2-11, 13, 14, 17, 18, 22-24, 26 and 27-34 T13N R13E; Sections 27, 28, 33, 34 and 36 T14N R12E; and Sections 28, 31, 32-34, and 36 T14N R13E MDB&M.

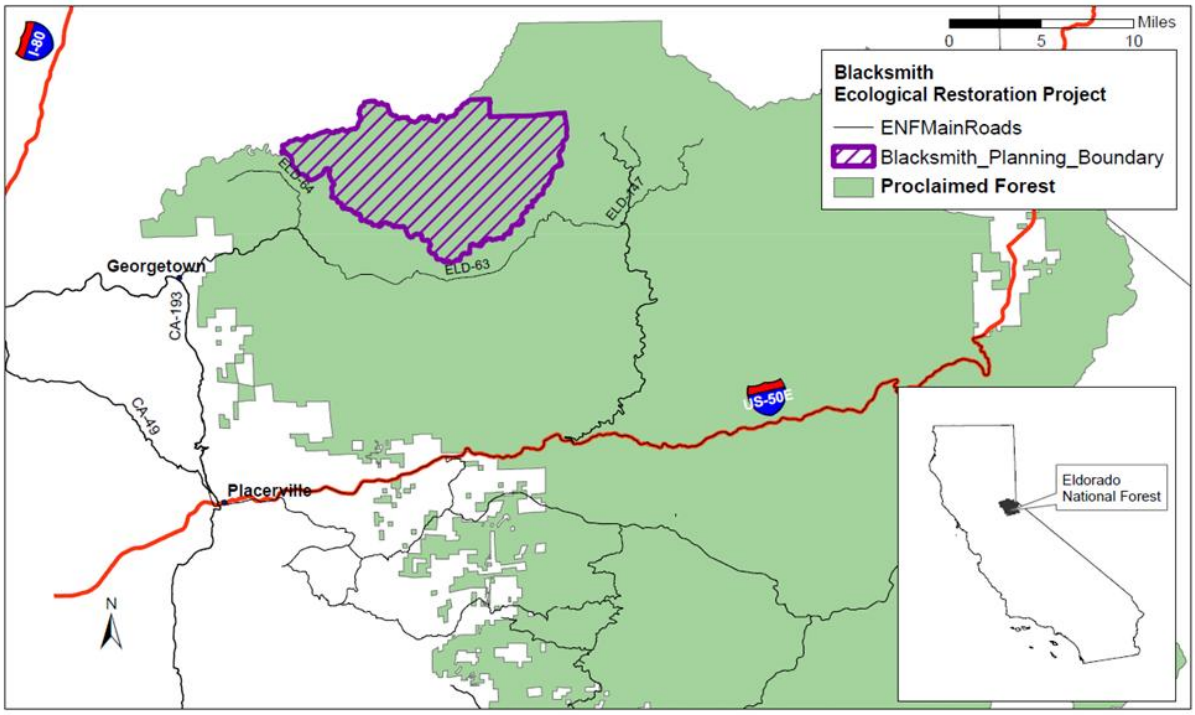

Figure 1 Project Location Map for the Blacksmith Ecological Restoration Project

Beginning with meetings in April, 2012, the proposed action was developed using a collaborative effort to try and bring into line the goals for ecological restoration, concern for California spotted owl, and the Forest's ability to implement the project. Research scientists from the University of Wisconsin, Pacific Southwest Research Station, and interested members of industry and the environmental community were consulted during the course of several field and office meetings. Prescriptions for treatment were based on the information identified in these collaborative meetings.

Purpose and Need for Action

The underlying need(s) for this proposal include:

1. There is a need for changing potential fire behavior during weather conditions that result in extreme fire intensity and severity across a considerable portion of the landscape to increase the fire resilience of stands and improve options for fire suppression and wildfire management. The reasons for this need are that current conditions put large areas of the landscape at high risk for unacceptable loss from wildfire and that loss jeopardizes ability for the landscape to be managed for desired conditions.

   The project landscape presents difficult access to fire starts due to topographic features and lack of roads and trails to access fires. Management of a large fire in this area would require utilizing

ridge lines and road systems to contain a fire. Topographically critical zones for fuel treatment are the two east-west ridges, which dominate the landscape that includes the project area, and south facing slopes above the Rubicon River canyon. The Rubicon River is a drainage of concern due to minimal large fire history and accessible areas to contain a fire in the canyon should a fire start.

In addition to the importance of the area for the California spotted owl as indicated by Verner (1992), the area's watersheds are important sources of clean water that support hydroelectric power, as well as recreation use, and domestic and wildlife needs. The threat of large scale, high severity wildfire jeopardizes the Forest Service's directive to manage the project area for the recognized multiple use benefits associated with healthy forests, including diverse wildlife habitat conditions, clean water, quality recreational experiences, and productive soils. The stand replacing Star Fire which burned east/northeast of the project area in 2001 provides a real example of the problem fire behavior which can occur in this landscape and the resulting effects. The Star Fire burned 16,800 acres of which 32% (5,501 acres) burned as a stand replacing fire. The loss of habitat for late seral wildlife along with the damage to the forest ecosystem within this area will take more than a century to recover, even with intensive restoration efforts.

Sufficient treatment, based upon a strategic spatial design, and recognizing the historical ecological processes and landscape patterns is needed to ensure effectiveness of fire behavior modification and enhanced stand resilience at the landscape level. The theoretical basis for changing fuel structure to reduce fire hazard is well established (Scott and Reinhardt, 2001; Graham et al, 2004; Peterson et al, 2005; Stephens et. al, 2009). The theoretical benefits of fuel manipulation are supported by real world reviews of wildfires and their interaction with fuel treatment areas (Raymond and Peterson, 2005; Omi et al, 2006; Safford et.al 2012).

Identified priorities are to treat the ridgetops, and where it is feasible, to treat midslope areas to create a flanking action to minimize the spread of the fire upslope to reduce fire spread and intensities. Midslope treatments buy time to construct controls along strategic ridgetop locations and to find accessible spur ridges to contain the flanks of a fire. Midslope treatments along Blacksmith Road present a unique area to treat midslope fuels to create that flanking potential of fire running out of Long Canyon. Treatment along roadways and corridors is also a priority as fire risk in the area is elevated along the roadways and corridors.

Fire behavior in the Sierra Nevada mixed conifer forest is strongly influenced by stand structure as it relates to live and dead fuel loading and ladder fuels. Fuels in the area vary with topography and previous natural and human activity. In the area a variety of fuels conditions exist and vary between areas which have a lot of ladder fuels and those that are relatively open. High density stands with large amounts of ladder and surface fuels increase probability of crown fire, high flame lengths and high fireline intensities. Surface fuels that promote high flame lengths include shrub and understory with ladder fuels present. Based on the 2012 Fuels and Fire Behavior

Synopsis (Ebert, 2012), areas that currently exhibit a build-up of fuels would easily allow a fire burning under 90th percentile weather conditions to make the transition from surface fire into the crowns of the trees, causing high mortality and continued fire spread into the surrounding forest stands. Other areas are identified as needing maintenance treatments to modify fire behavior and maintain or keep them trending toward desired conditions. For example, areas which have Bear Clover can have high flame lengths due to their high chemical content. Fuels in the Blacksmith area are coupled with steep slopes contribute to problem and extreme fire behavior.

The number, size, and intensity of wildfires within the Sierra Nevada have been altered from their historical range (Miller et al, 2009; Bouldin, 1999; Beesly, 1996; and McKelvey, 1992). Forests in this area were historically subject to frequent, low intensity fires that resulted in open, fire-resistant stands of trees. Historically much of this area would have burned with an 11-29 year fire return interval, with more than 90% of the landscape burning at less than a 16 year return interval (Estes, 2012; Safford et al. 2011; and Van de water and Safford 2011). The general area has had a long and rich history of human use and activity. Past activities including historic grazing of domestic animals, historic logging practices that included selective logging of larger pines and lack of follow-up slash treatment, mining, and more recently several decades of fire exclusion have contributed to altered fire regimes. Stand replacing fire at the current potential level is not a sustainable or desired event in these systems

Desired Conditions:

For 0-2X plantations (trees less than 12" dbh):

- 3 inches and smaller surface fuel load less than 5 tons per acre; less than 0.5 foot fuel bed depth, stocking levels that provide well-spaced tree crowns; less than 50% surface area with live fuels (brush); and tree mortality less than 50% of existing stocking under 90th percentile fire weather conditions in 2x plantations (2004 SNFPA ROD, p. 50).

For brush and shrub patches:

- Remove material necessary to achieve an average of 4 foot flame lengths under 90th percentile weather conditions; double fireline production rates; and ensure treatments are effective for 5 to 10 years achieved by removing appropriate amounts of vegetative material (2004 SNFPA ROD, p. 50).

For conifer forest types:

- Reduced fuel concentrations resulting in shorter flame lengths (< 4 feet) during 90th percentile weather conditions; increased fireline production rates for suppression forces, and treatments effective for more than 5-10 years (2004 SNFPA ROD, p. 51).
- Canopy fuels arranged such that the fuel continuity is broken both horizontally and vertically. Probability of crown fire initiation less than 20% during 90th percentile weather conditions (2004 SNFPA ROD, p. 50).

- Potential fire intensity decreased to a level where tree mortality would be less than 20% of the dominate and co-dominate trees under 90th percentile weather conditions (2004 SNFPA ROD, p. 50).

Measurement Indicators: Flamelengths, Stand Structure (Height to Live Crown, Heterogeneity, Canopy Density), Strategic Placement of Treatments, Protection of PACS, Longevity of Treatments

2. There is a need for restoring a composition of tree species and size classes that is more resilient to disturbance so that stands are likely to be more sustainable into the future, through applying appropriate silvicultural techniques to increase age class diversity and favor species better adapted to disturbances typical of this forest type. The reasons for this need is that over-dense stands experience high levels of inter-tree competition for resources, resulting in declined health and abundance of desired species, and increased risk for high levels of mortality (Barrett 1982; Oliver, 1995; Cochran and Barrett, 1995; Bakke, 1997) thus threatening the ability of National Forest System lands to be managed for desired conditions. Forest Health protection risk mapping shows that currently 54% of the project planning area (15,775 acres including 3,193 acres which would be expected to be improved through completion of a separate project) is at risk of losing 25% or more of the stand volume within 15 years. Reducing competition for moisture, nutrients, and sunlight among trees reduces stress and enables trees to withstand stress causing situations, such as bark beetle attack. While some insect and disease activity within the forest is a natural part of the forest and considered an important component, high mortality levels can limit management options for manipulating stands to achieve desired conditions and can increase the amount of dead fuels and the potential for extreme fire behavior.

   Achieving desired conditions in these stands includes providing conditions that favor desired species and size classes of trees. In the Sierra Nevada mixed conifer forest type and ponderosa pine type, shade tolerant species (cedars and firs) currently grow at higher density levels than shade intolerant species (pines and California black oak). Changes in fire regimes and fuel loading have resulted in a change in species composition and increased density on all aspects. Dense, closed canopies that have developed in the absence of frequent fire tend to favor shade tolerant white fir, incense cedar, and Douglas fir, and to exclude shade intolerant ponderosa pines, oaks, and sugar pines that would otherwise occur along ridges and south facing aspects in the project area. These shade tolerant species form dense under-stories that act as fuel ladders to the larger overstory trees, and are generally more susceptible to mortality from fire.

   On the landscape a large decease in area identified as ponderosa pine forest type and an increase in the mixed conifer type over the last century indicates a clear shift from more open, pine dominated stands to stands composed primarily of more shade tolerant species due to a lack of fire and altered disturbance regimes (Collins et. al. 2011). This shift has resulted in increases in fire intensity and

severity, decreases in tree vigor and growth, and suppression of hardwoods, primarily black oak, from shade tolerant conifers. Additionally, a decrease in chaparral has been evident on the landscape.

There is a need to apply the necessary silvicultural treatments to accelerate the development of key habitat and old forest characteristics by facilitating the growth of desired species, allowing stands to more rapidly develop large trees and increase the probability that these stands survive into the future. The reason for this purpose is that the project area is composed of a mixture of both plantation and non-plantation stands, many of which are not on a trajectory to develop into preferred old forest habitat due to risk of loss from fire and from bark beetle and disease. Inter-tree competition in overly dense stands results in slow growth and increased risk of mortality for these trees.

There is a need to reduce stand density sufficiently in commercially thinned areas to provide for the vigor and growth of the desired residual tree species through the planning period (approximately 20 years). The reasons for this need is that the improved vigor of desired residual trees and of lower density areas on the landscape improve species and stand diversity to help reduce susceptibility to bark beetles and to improve likelihood of these stands being sustainable into the future.

A purpose of this proposal is to design treatments to increase heterogeneity within the landscape by increasing heterogeneity at fine (within stand) and coarse (across landscape) scales using topography as a guide for varying treatments. The reason for this purpose is that in the Sierra Nevada mixed conifer forest stands along ridge-tops and south facing slopes are typically more open, pine / oak dominated, while stands in lower topographic positions such as canyons and on north slopes typically support higher stand densities and more shade tolerant species. Topography and microsites within stands can be used as a guide for varying intensity of treatments to promote shade intolerant pines and hardwoods and decrease the amount of shade tolerant and fire intolerant Douglas-fir, white fir and incense cedar where fire exclusion has caused an increased abundance of these species (North et al, 2009).

Desired Conditions:

- Residual stands composed of more fire and drought resilient tree species (i.e. ponderosa and sugar pine, and California black oak) (2004 SNFPA ROD, p. 52).
- Improved stand vigor, improved tree vigor, improved growth rates and ability to combat insects and disease (2004 SNFPA ROD, p. 49).
- Increased regeneration of fire resilient tree species (2004 SNFPA ROD, p. 52).
- Hardwoods promoted within stands (2004 SNFPA ROD, p. 52).
- Stand heterogeneity promoted (2004 SNFPA ROD, p. 41).

Measurement Indicators: Stand Vigor (Competition for resources and risk of tree mortality, tree growth), Stand Structure (Basal Area (BA), Trees per Acre (TPA), diameter distribution), Tree Species Composition (TPA and BA per acre by species)

3. There is a need for protecting, increasing and perpetuating old forest ecosystem habitat components and conserving their wildlife species. The reason for this need is that stands within the project area that currently support old forest ecosystem associated wildlife species, such as northern goshawk and California spotted owl, are at risk of loss, which would result in further fragmenting old forest ecosystem habitat, and other areas are not developing sufficiently to expand habitat or provide alternative habitat. The project area is located identified in 1992 in the Pacific Southwest Technical Report (GTR-133) (Verner, 1992) as an area where habitat fragmentation makes successful dispersal of the spotted owl more difficult and where the likelihood of quick replacement of owls in vacated habitat is reduced for the California spotted owl which is considered by the Forest Service to be a "sensitive" species.

   A purpose of this proposal is to reduce the risk of mortality and loss of existing large, old trees, and valuable wildlife structures thereby maintaining the structure and function that they provide. The reason for this purpose is that the threat of loss of these structures over a substantial portion of the landscape would reduce the quality and quantity of habitat.

   Desired Conditions:
   - 50-70% canopy cover in California spotted owl home range core areas (HRCA) (2004 SNFPA ROD, p. 40).
   - Stand structures that vary in size and tree species composition creating horizontal heterogeneity (2004 SNFPA ROD, p. 41).
   - Multi-tiered canopies that create vertical heterogeneity by providing for a range of tree sizes from seedlings to very large diameter trees (2004 SNFPA ROD, p. 41).
   - Improved continuity and distribution of old forest ecosystems and habitats (2004 SNFPA ROD, p. 41).
   - Stands that provide a continuous supply of snags and live decadent trees suitable for cavity nesting wildlife across a landscape (2004 SNFPA ROD, p. 51).
   - In westside conifer and hardwood stands retain four of the largest snags per acre. Snags clumped and distributed irregularly across treatment units (2004 SNFPA ROD, pp. 51-52).

   Measurement Indicators: Habitat Suitability (Amount of 5D and 5M, amount of reproductive habitat, amount and quality of foraging habitat), Occupancy and Use by wildlife species, Stand Structure (TPA, Basal Area per Acre, Diameter Distribution, Canopy Cover, Understory Characteristics, California wildlife habitat relationship (CWHR) Classifications, Wildlife Trees, Snags and Down Logs), Growth and Maintenance of Large Trees, Short term and long term risk of loss for habitat

4. There is a need for improving access and reducing sediment from roads through improvements to the Forest Transportation System. The reasons for this need are that roads play a vital role in providing access for resource management needs and public recreation use, however both dispersed recreation use and past management activities in the project area have created poorly located or unmaintained routes that are contributing to reduced watershed health, increased sedimentation and soil loss, and impaired aquatic habitat.

   A purpose of this proposal is to repair road running surfaces to reduce the loss of existing native surface material, to replace inadequate drainage crossings, to cut or trim trees and brush for sight distance improvement, to eliminate ruts, repair ditches, install waterbars and dips on roads with inadequate runoff control, and to install gates to control seasonal use or replace existing, non-functional gates or barriers on roads designated as open to the public or for management activities and to restrict use and minimize resource damage where existing roads are not designated for public use. The reason for this purpose is while road access is needed to implement project activities, unneeded and poorly located roads can negatively impact forest resources. A fairly extensive network of roads exists in the project area, with many that are in a suitable condition or need only minor maintenance in order to implement project activities. However, there are some areas that are not currently accessed by roads and some roads which are narrow and unimproved, thereby limiting necessary access to implement treatments.

   Desired Conditions

   - Access provided for resource management and public for recreation purposes (ELD LRMP p. 4-5).
   - Hydrologic connectivity, erosion and sediment delivery, and channel stability is improved or maintained in acceptable condition (2004 SNFPA ROD, p.43).
   - Improved aquatic organism passage and enhanced aquatic habitat conditions (2004 SNFPA ROD, p. 43).
   - Maintain soil productivity

   Measurement Indicators: Miles of Maintained or Improved Road, Miles of Road Decommissioned, Improved Aquatic and Riparian habitat, Risk for Erosion and Sediment Delivery

5. There is a need for designing and implementing project activities to be cost effective. This is to ensure that sufficient treatments occur to meet project objectives during the planning timeframe and to maintain future management options for efficient and effective management of National Forest System lands. Allocated funding and grant opportunities to accomplish project activities are limited, and with several other large scale projects ongoing on the Forest it is unlikely priorities will be switched to allocate substantial funding to accomplishing this project at the expense of other projects. A combination of reasonably expected appropriated funds and cost-

offset opportunities allows for efficiently accomplishing all of the treatments identified in this project. Furthermore, the role of the Forest Service in providing a supply of wood products for local manufacturers sustains a part of the employment base in rural communities and helps to maintain infrastructure near National Forest System lands. The preservation of this infrastructure helps to maintain future options for effectively and efficiently achieving objectives on National Forest System lands.

Desired Conditions:

- Forest Service contributes toward a continuous flow of forest products, providing for commercial product removal that contributes both directly and indirectly to the local economy promoting activities which maintain local infrastructure and management options for the future (2004 SNFPA ROD, p. 9)
- Treatments are designed to be cost effective to maximize the number of acres that can be treated under a limited budget (2004 SNFPA ROD, p. 34).

Measurement Indicators: Amount of Sawlog Volume Generated (mmbf) and Appraised Value, Cost of Treatments, Number of Full-time Equivalent Jobs Created or Maintained

Proposed Action

The action proposed by the Forest Service to meet the purpose and need is:
The Proposed Action includes a combination of fuels reduction and forest health improvement actions on approximately 7,014 acres of National Forest System land including thinning with the use of both ground based mechanical and skyline harvest systems, tractor piling, mastication, herbicide application, prescribed burning, and hand thinning. Planting of ponderosa and sugar pine is proposed to restore pine species to specific areas. Road construction of 1.5 miles of new road is proposed in order to facilitate the treatment activities and they will not be designed for public use. Road reconstruction to facilitate treatments and to improve water quality through installation of Best Management Practices (BMPs) is proposed on approximately 40 miles of existing roads. The proposed action is described in more detail in Chapter 2 under Alternative 1, page 18.

Decision Framework

Given the purpose and need, the deciding official reviews the proposed action, the other alternatives, and their environmental consequences, in order to determine whether to implement the proposed action as described, select a different alternative or take no action at this time.

Forest Plan Direction

The Proposed Action and alternatives are guided by the Eldorado Forest Land and Resource Management Plan (LRMP), as amended by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA). The Forest is subdivided into land allocations (management areas) with established desired conditions and associated management direction (standards and guidelines). Land allocations that apply to this

proposal include: General Forest, California Spotted Owl Protected Activity Center (PAC), Northern Goshawk (PAC), California Spotted Owl Home Range Core Area (HRCA), and Riparian Conservation Areas (RCAs).

Public Involvement

A Notice of Intent (NOI) to prepare an Environmental Impact Statement for the Blacksmith Ecological Restoration Project was published in the Federal Register on October 25, 2012. The notice asked that input on the proposed action be received by November 30, 2012**.** In addition, as part of the public involvement process, the Forest Service has:

- had this project listed on the Schedule of Proposed Actions (SOPA) since October 2011;
- sent a project specific scoping notice in October 2012 to 27 individuals, organizations and government agencies, including federally recognized tribal governments, tribal groups currently applying for federal recognition, and Native American organizations and non-profit groups that are interested in projects that are located on this portion of the Forest or who requested notification on the project; and
- has held collaborative meetings with members of the public, industry groups and environmental organizations who have expressed an interest in the project. Meeting notes from collaborative meetings are available in the project record.

Approximately 20 comments on the proposed action were received.

Issues

Comments were used to formulate issues concerning the proposed action. The Forest Service separated the issues into two groups: significant and non-significant. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…". A list of non-significant issues and reasons why they were found non-significant may be found at **the scoping comment summary** in the project record located at Georgetown Ranger Station, Eldorado National Forest**.**

As for significant issues, the Forest Service identified the following issues during scoping:

Issue #1: The proposed action may have significant negative effects to the California spotted owl population due to treatment of high quality habitat coupled with declining population trends in the area.

Alternative 4 was developed to address this issue.

Key indicators: the probability for loss of occupancy and recolonization for individual territories and the impacts of loss of occupancy to population demography.

Issue #2: Treatment may not be intensive enough to modify wildfire behavior and improve forest health or to provide long term habitat, since it does not take into account information in Lydersen and North 2012 in treatment design for specific landscape positions.

Alternative 5 was developed to address this issue.

Key indicators: short and long term crown fire potential, short term and long term risk for loss of habitat, stand vigor (competition for resources and risk of tree mortality, tree growth), stand structure (QMD, BA, TPA), Tree Species Composition (TPA and BA per acre by species)

Issue #3: Project may not be operationally feasible due to economic considerations.

Key indicators: appraised value and cost of treatments.

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes and compares the alternatives considered for the **Blacksmith Ecological Restoration Project**. It describes both alternatives considered in detail and those eliminated from detailed study. The end of this chapter presents the alternatives in tabular format so that the alternatives and their environmental impacts can be readily compared.

Alternatives Considered in Detail

Based on the issues identified through public comment on the proposed action, the Forest Service developed 3 alternative proposals that achieve the purpose and need differently than the proposed action. In addition, the Forest Service is required to analyze a No Action alternative. The proposed action, alternatives and no action alternative are described in detail below. Appendix A includes detailed maps and tables for unit specific treatment and maps for road work information for each alternative analyzed.

Alternative 1

Proposed Action

Thinning

1) Approximately 2,476 acres are proposed for thinning with the cutting and removal of select commercial and non-commercial size trees using a combination of variable density thinning and thinning from below to maintain or increase within stand heterogeneity while reducing ladder fuels in strategic locations and where machinery can effectively and efficiently achieve project objectives. Thinning would be performed using a combination of ground based and skyline logging systems. On slopes generally less than 35%, a ground based whole tree logging system would be used to remove both commercial and non-commercial trees on approximately 2,399 acres and non-commercial trees on an additional 20 acres. A skyline logging system would be used to thin approximately 57 acres of treatment units with slopes generally greater than 35%.
    a. Thinned trees greater than 4 inches dbh would be removed to landings except where specified for retention.

    b. Where existing skid trails are not available on areas of greater than 35% slope, new skid trails would be located to avoid concentration of surface flow to minimize rills and gullies.

    c. Units identified for skyline yarding would include use of mechanical equipment to cut and bunch thinned trees on slopes generally less than 50%. Hand falling would be used in areas with slopes generally steeper than 50%.

    d. Commercial tree removal would emphasize a clumpy distribution of residual trees rather than equal spacing of retained trees depending on the current structure, species distribution, and health of trees (variable density thin). Enhancement of individual black oak trees, groups of black oak trees, and larger pines would occur through selective removal of over-topping or encroaching conifers. Particular attention would be given to providing horizontal heterogeneity to promote diverse habitat conditions based on information in PSW-GTR 220 and PSW-GTR 237.

    e. The largest trees would be retained in each stand as thinning would focus on removal of smaller trees.

    f. Removal of trees ≥ 30” dbh would not occur, except to allow for equipment operability or safety.

    g. Existing and operation generated slash and brush would be tractor piled, masticated, and/or burned after harvest operations. Unit specific follow-up treatments proposed

are shown in Appendix A. Mastication or tractor piling and prescribed burning would occur shortly after the thinning is completed. Post-harvest machine piling and burning of existing and operations slash would occur as necessary to reduce surface fuels in preparation for the reintroduction of prescribed fire. Mastication may be substituted for tractor piling where surface fuels can be more effectively treated by this method.

h. Biomass accumulated on landings could be disposed of in a number of ways, including on-site burning, commercial and personal use firewood, or as co-generation fuel if plausible

Piling

2) Tractor pile or grapple pile activities would treat brush, slash and downed woody debris. Tractor piling is proposed for up to 2,026 acres as a follow-up treatment and 8 acres as the initial treatment.

Mastication

3) Mastication would treat brush, shrubs, slash, and small trees by mulching the material into fine chips. Mastication of competing vegetation is proposed as the follow-up treatment on approximately 373 acres and as the initial treatment on approximately 478 acres of plantation stands.

Hand Thinning

4) A combination of chainsaw cutting and prescribed burning is proposed on approximately 195 acres of sensitive sites to reduce fuel loadings, and in areas with mostly non-commercial removal.

Planting

5) Approximately 60 acres of planting in 3 treatment units is proposed. Planting of ponderosa and sugar pine would occur in unit 329-24 and in portions of unit 320-69 to restore pine areas that have a high concentration of white fir mortality from Annosus root rot. Planting is also proposed for a portion of unit 323-47 which burned in the long fire and has converted to a field of deer brush.

Prescribed Burning

6) Pile burning and underburning are the two primary techniques of prescribed fire proposed in this project. Underburning is proposed as the initial or primary treatment on approximately 3,758 acres where land allocations, environmental constraints, or stand conditions makes prescribed fires the preferred tool to achieve treatment objectives. All treatment units, except those specifically excluded from proposed burning, are proposed for follow-up prescribed burning. Pile burning is proposed as a follow-up treatment on 2,042 acres and underburning is

proposed as a follow-up treatment on approximately 6,786 acres. Within thinning and piling units, underburning may be implemented concurrent with pile burning or separately.

a. All proposed fire treatment areas would be ignited using ground based firing except the north eastern portion of unit 5, above the Rubicon River. In this unit, several hundred acres would be ignited through aerial firing techniques using a plastic sphere dispenser (PSD).

b. In preparation for prescribed fire, perimeter line construction would be needed where roads, trails, or natural barriers are absent. This may involve hand cutting of vegetation including trees up to 6-inch diameter, pruning, and scraping a bare soil line, or line construction with a D-6 or smaller dozer.

c. Dozer lines would be placed in roads and in mechanical treatment units where tractor operation is not restricted up to 35% slope, where additional clearing is required. Handlines would be placed on slopes greater than 35% and where existing roads or trails are not available for fire control lines.

d. Hand thinning and piling of material up to 6 inches in diameter may occur in burn only units in preparation for prescribed fire implementation.

e. Burning would be excluded in the Ralston Fire area and in hand thin only treatments where fire anticipated impacts would conflict with other resource management objectives (units 0040, 321-2, 321-4, 322-26, 325-1, 325-3, 325-7, 325-8, 325-9, and 325-10)

f. Treatments proposed for initial prescribe burn treatments may have 2-3 follow-up prescribed fire treatments to achieve objectives for reduced surface and ladder fuels. These follow-up treatments would occur typically in 5 to 7 year intervals after initial treatment.

Invasive Plants

7) Where possible, occurrences of high priority invasive plant species within or in proximity to project activities would be treated by hand pulling, if feasible, (spring-summer before seed formation), lopping at the appropriate time, burning with blow torch, or with herbicide treatment prior to other project activities to reduce potential for new occurrences or spread of existing occurrence, except where otherwise noted.

Herbicide

8) Herbicides are proposed for targeted plant control using ground based application with a directed low-pressure spray. Mastication of 242 acres of plantations with resprouting brush species would have follow-up herbicide application if brush cover returns at greater than 30% following initial treatment. Planted areas in 3 units totaling approximately 60 acres would also be treated with herbicide to reduce brush competition for survival and growth of planted seedlings. Approximately 80 acres of invasive plant populations in proximity to treatment units would be treated with herbicide where populations are larger than what can feasibly be treated by hand given resources available to do the work efficiently where there are no other resource constraints such as riparian exclusion buffers.

    a. Depending on treatment timing and brush size, initial treatment as mastication could be converted to initial treatment with herbicide in approximately 118 of plantation established after the Ralston fire (units 321-1, 321-4, 325-1, 325-3, 325-7, 325-8, 325-9, and 325-10).

    b. Backpack sprayers would be used to apply spray in sweeping motions. With the method proposed, the herbicide is released through a handheld wand with a trigger that is controlled by the applicator. The spray would be applied directly to targeted plants and spraying would be stopped when moving between plants.

    c. A low nozzle pressure (15 psi) that produces a relatively large droplet would be required. A pressure gauge or a pressure regulator would be required on backpack sprayers. Prior to the start of application, all spray equipment would be calibrated to insure accuracy of delivered amounts of pesticide. Periodically during application, equipment would be rechecked for calibration.

    d. Additives in the form of colorants and adjuvants would be added to the herbicide mixtures. A colorant would be added to assist in the inspection process to determine the location of coverage. An adjuvant or surfactant would be used to help the herbicide mixture be absorbed into the plant.

Table 1 Chemical Formulation, Application Rate, and Additives

Herbicide	Trade Names	Target Species	Timing	Proposed Application Rate
Aminopyralid*	Milestone VM or equivalent	Rush skeleton weed, Italian plumeless thistle, medusa head and starthistle	Prior to bolting	0.078-0.11 lb a.e./acre
Glyphosate	Rodeo or equivalent	deer brush, scotch broom, green leaf manzanita, choke cherry, whitethorn, tree of heaven, and sweet clovers	when target plants are actively growing	2 to 4 lb. a.e./acre

Adjuvant	Trade Names
Spreader-Penetrator	Syl-Tac, Hasten or Competitor (aquatic formulation)
Marker Dye	Hilight Blue or Colorfast Purple
*Glyphosate may be substituted for aminopyralid where invasive plant populations proposed for treatment with aminopyralid overlap with proposed glyphosate treatments and plants can be effectively treated to minimize pesticide application.	

9) Herbicide application is not proposed within the buffers for streams and aquatic features in Table 2.

Table 2 Herbicide Application Exclusion Zone for Streams

Stream Type	Treatment	Distance
Perennial Streams and Special Aquatic Features	Aminopyralid	300
	Glyphosate	100
Intermittent Streams	Aminopyralid	150
	Glyphosate	50
Ephemeral Streams	Aminopyralid	50
	Glyphosate	25

Transportation System Management and Watershed Improvements

10) Road reconstruction to facilitate treatments and to improve water quality through application of Best Management Practices (BMPs) is proposed on approximately 41 miles. Reconstruction activities include: road rocking of specific segments, replacement of inadequate drainage crossings, cutting or trimming of trees and brush for sight distance improvement, elimination of ruts, gate or barrier installation to control seasonal use or replacement of existing, non-functional gates or barriers, ditch repair, and installation of waterbars and dips on roads with inadequate runoff control. (Routes 13N41C, 13N41E, 13N41EA, 13N42, 13N42B, 13N42B, 13N42BW, 13N42C, 13N42D, 13N42E, 13N65B, 13N65C, 14N08B, 14N11B, 14N17, 14N17A, 14N17B, 14N21, 14N22, 14N22A, 14N22AA, 14N22B, 14N22K, 14N25E, 14N25J, 14N25JA, 14N25L, 14N25M, 14N25N, 14N25P, 14N25PA, 14N25R, 14N25RA, 14N25S, 14N25T, 14N31, 14N31C, 14N31D, 14N31E, 14N31F, 14N34DA, 14N54, 14N59, 14N25A).
    a. In addition to the general activities that would install drainage and erosion control features, the following specific activities would be included for road reconstruction in these areas:
        - Drainage structures would be armored by installing aggregate on portions of road 14N21 in Section 18, T13N R13E.
        - Crossings on north spur off 13N42E would have appropriately sized culverts installed so as to not impede aquatic organism passage.
        - Aggregate would be installed on portions of road 13N42B and 13N42C.
        - An 18-24” culvert would be installed on the crossing in unit 323-42.
        - On Road 14N17A near unit 324-43 the culvert on the southern stream crossing would be cleaned. The northern stream crossing would have a new

culvert installed with an inboard ditch above road line and flow rerouted or a catchment built.

- The waterhole pad on 14N54 would be armored if used

11) Road construction of 1.5 miles is proposed to facilitate silviculture and fuels reduction treatments.

12) Transportation management with the project would be applied consistent with the Eldorado National Forest Public Wheeled Motorized Travel Management Final Environmental Impact Statement (FEIS) (2008). Roads that are not open to the public would be blocked after use with gates or native material.

13) Access to and use of dispersed recreation sites in units 323-41, 324-38, and 325-02 would be controlled to reduce resource damage by blocking of non-system routes, constricting use area with boulders or other material, and portions of the area would be rehabilitated with ripping and seeding.

14) The culvert on 14N54 near unit 321-13 would have vegetation cleared out and the downstream side would be armored.

Alternative 2

No Action

Under Alternative 2, current management plans would continue to guide management of the project area. No silvicultural or transportation improvement activities would be implemented to accomplish the purpose and need.

Alternative 3

Non-Commercial

This alternative was developed in response to the November 3 2009 Order from the United States District Court, Eastern District of California from Case 2:05-cv-00205-MCE-GGH to include a non-commercial funding alternative at the Project Level for the Sierra Nevada Forests Fuel Reduction Projects.

The Non-Commercial Alternative proposes to remove only those trees prescribed for removal in the Proposed Action that are needed to meet the minimum objectives to modify fire behavior on the landscape. In most stands proposed for commercial treatment, it has been determined that removal of intermediate and overtopped trees up to 12 inches in dbh, followed by tractor piling or mastication, and follow-up prescribed burning would achieve the minimum fuels objectives defined in the 2004 SNFPA.

Under this Alternative, treatment unit layout for mechanical thinning units would remain the same as the Alternative 1 except that units proposed for treatment using skyline yarding systems would not be treated with this Alternative as skyline systems would not be practical for non-commercial treatments, units proposed for prescribed burning only would be treated where they facilitate burning of mechanical treatment units, and treatments for purposes other than strategic fuels reduction would not occur under this alternative. Activities that would not occur include: reconstruction of roads not needed for access to treatment units, burning associated with ecological restoration rather that strategic fuels reduction, planting of pine, and harvest to enhance oak and pine. Because material would not be removed, proposed road construction would also not occur.

In general, the maximum diameter limit for removal with thinning would be 12-inches; however, in order to facilitate equipment access to treat the units effectively, there may be circumstances where larger than 12 inch trees are removed. This would include removal of trees for landings, skid roads and in order to access some denser areas of stands with mechanical harvest equipment. Thinned material would be brought into landings and disposed of similar to the proposal for biomass removal in the proposed action.

This alternative would include the following treatments:

- 2,401 acres of mechanical, non-commercial thinning with follow-up surface fuels treatments;
- 8 acres of piling as an initial treatment;
- 478 acres of mastication;
- herbicide on up to 302 acres;
- hand thinning on 8 acres;
- 306 acres of prescribe burn only;
- 0.8 miles of road construction; and
- 10 miles of road reconstruction

Alternative 4

Reduced Owl Impact

This Alternative was developed based on comments that given the reported population decline in the area, thinning of high quality California spotted owl habitat with the project could lead to significant negative effects to owl population demographics in this area.

This Alternative was designed to reduce risk of negatively affecting owl occupancy and use of individual territories from mechanical thinning while meeting fire behavior modification objectives in key areas. With this alternative thinning is focused to develop future habitat quality in areas that are currently classified as having low quality habitat and to reduce risk of loss of habitat to fire. Canopy reducing treatment units that affected territories with limited amounts of mature conifer forest (MCF)

habitat, were reviewed and remained in Alternative 4 where removal of larger trees and associated cover was necessary to strategically alter fire behavior and change modeled fire outcomes.

This alternative would include the following treatments:

- 1,860 acres of mechanical, commercial thinning with follow-up surface fuels treatments as proposed in Alternative 1
- 80 acres of mechanical thinning maintaining greater than 70% canopy cover with follow-up surface fuels treatments,
- 20 acres of non-commercial mechanical thinning;
- 8 acres of piling as an initial treatment;
- 478 acres of mastication;
- herbicide on up to 302 acres;
- hand thinning on 195 acres;
- planting on approximately 60 acres;
- 3687 acres of prescribe burn only;
- 1.2 miles of road construction; and
- 34 miles of road reconstruction

The description of treatments is the same as Alternative 1.

Alternative 5

Increased Pace and Scale for Restoration

This alternative was developed based on comments that treatments proposed with the proposed action may not be intensive enough to modify wildfire behavior and improve forest health or to provide long term habitat, since it does not take into account information in Lydersen and North 2012 in treatment design for specific landscape positions.

Based on information on topographic variation in structure of mixed-conifer forests under an active fire regime from Lydersen and North 2012, approximately 1670 acres of stands proposed for thinning on ridge top positions would be thinned to a lower stand density than proposed with Alternative 1. Additionally 100 acres of thinning on Nevada Point Ridge would occur in a non-reproductive owl PAC (PLA0115) with this alternative.

This alternative would require a site specific Forest Plan for the following Standards and Guidelines for mechanical treatment stands.

- In some stands greater than 60 percent of the existing basal area would be removed.
- Canopy cover would be reduced by more than 30% within some individual treatment units.
- At least 50% canopy cover averaged within the treatment unit would not be retained in some areas where canopy cover is currently above 50% in stands within HRCA land allocation.

This alternative would include the following treatments:

- 2,572 acres of mechanical, commercial thinning with follow-up surface fuels treatments;
- 57 acres of thinning using skyline harvest systems;
- 20 acres of non-commercial mechanical;
- 8 acres of piling as an initial treatment;
- 478 acres of mastication;
- herbicide on up to 302 acres;
- hand thinning on 195 acres;
- planting on approximately 60 acres
- 3,649 acres of prescribe burn only;
- 1.5 miles of road construction; and
- 41 miles of road reconstruction

The description of treatments is the same as Alternative 1.

Design Criteria common to All Action Alternatives

The Forest Service has developed the following design criteria to be used for all action alternatives. The purpose of these design criteria is to avoid, or to minimize the potential for adverse effects to the resources discussed below.

Activities would be conducted so as to protect water quality by using BMPs, employed by the Forest Service and the State of California to prevent water quality degradation and to meet State Water Quality Objectives relating to non-point sources of pollution. In addition, the Forest would use site-specific mitigation measures that relate directly to these BMPs to minimize erosion and resultant sedimentation.

Mechanical Operations

1) Tractor piling would be precluded on slopes greater than approximately 35% and from sensitive areas, such as archaeological sites, sensitive plant zones and perennial stream course buffer zones or inner-gorge areas.

2) Hardwoods greater than 4 inches diameter would be retained except where removal is needed for equipment operability.

Cable Yarding (Skyline) *(except Alternative 3)*

1) Divots greater than 2 feet depth caused by mechanical harvesting equipment would be recontoured where it has a potential to channel water

2) Berms caused by skyline operations would be recontoured

3) Some slash would remain on skyline corridors following operations

Piling

1) Burn piles would be placed at least 50 feet from property lines to reduce risk of fire escape and facilitate burning.

2) Burn piles would be placed away from the boles of residual trees to reduce damage to residual trees. Where pile burning results in mortality in excess of Forest Plan standards, salvage of dead and dying trees may occur to allow for minimizing landing size for operations.

3) Hand piles would be placed outside of prescribed fire ignition exclusion zones or a minimum of 25 feet from any stream channel, whichever is greater.

Prescribed fire

1) Raking of individual legacy Ponderosa pines (pines with orange, smooth bark) and legacy sugar pine, typically 24" or greater, with more than 4" duff accumulation or with pre-existing fire scars would occur in stands prior to broadcast or underburning if the area is to be burned when duff is dry in order to reduce potential for loss of residual trees. Stands may be burned without raking when duff is saturated.

    a. Raked trees would have accumulated duff and litter removed within 2 feet of the tree bole. Raked material would be spread out beyond 2 feet from the tree bole so that mounds are not created. Trees with fire scars would be raked to bare mineral soil. Other raked trees would have no more than 2 to 3 inches of duff remaining.

    b. Raking would be preferably performed in late season and allow for at least one growing season for fine roots to recover prior to burning. At a minimum raking would be performed at least 60 days before prescribed fire implementation to allow for fine root recovery and reduce damage potential for residual trees.

2) Canopy cover reduction from burning would be designed to be less than 10% averaged across a treatment unit. Within PACs canopy cover reduction from burning would be less than 5%.

3) Within PACs, raking of fuel accumulations around down logs greater than 30" in diameter would occur if it is determined that more than ½ of these large down logs are likely to be consumed during burn activities.

4) Within PACs, additional hand treatments, including handline construction, tree pruning, and cutting of small trees (less than 6 inches dbh), would be conducted within 1 to 2-acre area surrounding known nest trees as needed to protect nest trees and trees in their immediate vicinity.

5) Within PACs, burn activities would be designed to have an average flame length of less than 4 feet.

6) Firing techniques or lining would be used to preserve retention pockets identified for preservation of existing wildlife use characteristics and down logs.

7) Following prescribed burning, water bars within skyline corridors would be refreshed and forest litter would be spread to reduce erosion risk.

8) A smoke permit administered by the local County Air Resource Agency would accompany burn plans. For this project the Placer County Air Pollution Control District would issue the permit.

9) Upon completion of burning, the visible character of the firelines would be disguised by spreading pine needles, brush, etc. where they intersect roads or trails in order to reduce the likelihood of the firelines becoming unwanted trails. Fireline rehab would be conducted according to standard Minimum Impact Suppression Techniques (MIST)

Snags, down logs and hazard trees

1) Standing dead trees (snags) over 16 inches in dbh that do not present a hazard for woods worker and public safety would be retained to provide for sufficient snag numbers.

2) The removal of dead and unstable live trees (hazard trees) of all sizes would occur along utility lines, timber haul roads and landings for woods worker and public safety throughout project implementation except where RCA restrictions for removal apply. Hazard trees within spotted owl or goshawk PACs would be left on site unless reviewed by a wildlife biologist.

3) Hazard trees within the Riparian Conservation Area (RCA) would be felled toward the stream and left in place below roads to provide for additional down wood in riparian areas.

4) Down logs greater than 16 inches in diameter within treatment units would be avoided where possible during mechanical operations, and would not be directly lit during firing operations to provide for down woody material.

Botany

1) Threatened, Endangered, sensitive, and watchlist plant occurrences would be flagged for avoidance prior to implementation for all activities other than those specifically identified and analyzed. Threatened, Endangered, sensitive, and watchlist plant occurrences discovered during project implementation would be flagged for avoidance where required.

2) In units 321-12, 322-20, 322-19, 7, 15, 18, 5a, 05b, 12a, 12b active prescribed fire ignition in areas occupied with Poa sierrae and Stebbins' phacelia would be avoided during burn activities to minimize impact to these plants.

3) Where additional handline construction is identified as needed for implementation, potential habitat within burn units would either be treated as occupied or evaluated prior to construction activities.

4) Prior to prescribed burn implementation, known occurrences of Threatened, Endangered, Sensitive, or watchlist plant taxa in burn units would be re-flagged. Re-flagging occurrences would clarify occurrence boundaries and ensure that fire lines are not cut through occurrences.

5) To reduce damage to pacific yew, Pacific yew greater than 1" dbh would be retained except where removal is needed for operability during mechanical treatment and direct ignition of areas of pacific yew would be avoided where possible during prescribed fire treatments.

6) Herbicide would not be applied within the exclusion buffers for sensitive plants to minimize potential for negative effects from drift or misapplication.

Table 3 Exclusion zones for Herbicide Application in proximity to sensitive plants

Herbicide	Distance from Sensitive Plants[1]
Aminopyralid	200'
Glyphosate	25'
[1]Measured from exterior edge of sensitive plant occurrence.	

Invasive plants

1) Invasive plant populations overlapping with populations of red hill soap root (Units 321-02, 325-01, 325-03, 325-07) would be flagged and avoided during implementation.

2) In units 321-1, 321-4, 325-1, 325-3, 325-7, 325-8, 325-9, and 325-10 invasive plant treatment would occur concurrently with initial herbicide release treatment if mastication is not used as an initial treatment.

3) Where treatment of occurrences of high priority invasive plant species is not feasible prior to the implementation of other treatments, occurrences would be flagged prior to project implementation and avoided by vehicles and equipment where occurrences are isolated.

4) Follow-up treatment of high priority invasive plant populations within or in proximity to project activities would occur for up to 3 years following implementation. Annual monitoring would occur during this timeframe.

5) All off-road equipment would be cleaned to insure it is free of soil, seeds, vegetative matter or other debris before entering National Forest System lands to prevent the introduction or spread of invasive plants. Prior to the start of operations, the Forest Service would do a visual inspection for such debris. Equipment would be cleaned prior to moving from a weed-infested unit to a weed-free unit.

6) All earth-moving equipment, gravel, fill or other materials would to be weed free. Onsite sand, gravel, rock, or organic matter would be used where possible.

7) Straw or mulch used for erosion control would be certified weed-free. A certificate from the county of origin stating the material was inspected is required. On-site material also may be used if it comes from a weed-free area.

8) Any seed used for erosion control or restoration would be from a locally collected source (ENF Seed, Mulch and Fertilizer Prescription, March 21, 2000). Plant taxa proposed for re-vegetation would be approved by the project botanist.

Riparian Conservation Areas (RCAs)

For all exclusion buffers, the distance is measured from the edge of the active channel/wetted perimeter or from the edge of riparian associated vegetation, whichever is greater.

1) Equipment use within RCAs is restricted by the equipment exclusion zones. Mechanical equipment would remain outside the exclusion buffers flagged on the ground and analyzed by the ID team or as described in
2)
3) Table 4 for vegetation treatment activities.

Table 4 Exclusion Buffers for Mechanical and Skyline Treatment in Proximity to Streams

Aquatic Feature Type	Buffer Distance (Feet)
Perennial Streams and Special Aquatic Features*	100
Intermittent Streams	50
Ephemeral Streams - <35% Slope	25
****Ephemeral Streams - 35-70% slope**	50
Ephemeral Streams - 70+% slope	75
*special aquatic features in the area include Ralston pond as well as its inlet and outlet channels. **Feller Bunchers would not operate on slopes greater than 35% within the RCA	

a) The number of crossings would be minimized. Crossings would be back-bladed after use, as necessary, to restore the natural relief and reduce erosion.
b) End lining of trees would not occur within equipment exclusion zones.
c) Within these exclusion buffers, approval by a Hydrologist, Fisheries Biologist, or Soil Scientist would occur for any additional: a) construction of new landings and/or modification and use of existing landings, b) construction of permanent and/or temporary roads, c) use of ground-based equipment and/or removal of vegetation in inner gorges.
d) Approval by a Hydrologist or Fisheries Biologist would occur for additional equipment crossings of perennial and intermittent streams or the placement of temporary stream crossing structures identified as needed during implementation.
e) Within exclusion buffers, felling and removal of hazard trees next to haul routes would occur, with the following restrictions: a) hazard trees with commercial material that can be reached with skidding equipment would be targeted for removal above roads, b) hazard trees below roads and those above roads but outside the reach of skidding equipment would be retained in place provided the felled trees would not adversely affect a stream course and associated stream structures.

4) Active prescribed fire ignition would occur outside of the exclusion zones identified in
5) Table 5. Fire would be allowed to back into the exclusion zone.

Table 5 Exclusion buffers for prescribed fire ignition in proximity to streams and other water bodies.

Aquatic Feature Type	Buffer Distance (Feet)
Perennial Streams and Special Aquatic Features	75 or riparian vegetation (whichever is greater)
Springs and Intermittent Streams	50 or riparian vegetation (whichever is greater)
Ephemeral Streams - <35% Slope	10
Ephemeral Streams - 35-70% slope	50
Ephemeral Streams - >70% slope	75

a. Ignition inside the prescribed fire ignition buffer would occur where further ignition is needed to moderate fire effects through control of flame lengths and burn intensity. Ignition near riparian vegetation buffers would be implemented to reduce non-riparian vegetation only (i.e. directing fire away from riparian vegetation).
b. Within inner gorges burning would be designed to maintain low intensity fire with flame lengths less than 4 feet to maintain effective ground cover. Prescribed fire activity would be excluded within inner gorges when fuel moistures and weather conditions are such that prescribed fire is projected to burn uniformly through these areas.

6) In Unit 325-07 Ralston pond as well as its inlet and outlet channels would be considered a special aquatic feature if treatment occurs when channels are wet. A 50 foot buffer for

herbicide application would apply on Ralston Pond as well as inlet and outlet channels if the pond is dry during herbicide application.

7) Treatment in the viewshed of the Rubicon River would be conducted so as to retain eligibility of the Rubicon River North of Ellicott's bridge as Wild and Scenic River.

8) Cattle fencing would be installed on the spring near Blacksmith Flat after thinning activities are completed in unit 323-45 to reduce potential impacts from increased accessibility of the spring by cattle

Roads and trails

1) Designated trails would be protected during project activities to maintain use and access.

2) In addition to the seasonal closure identified by the Wheeled Motorized Travel Management Final Environmental Impact Statement (FEIS) (2008) roads identified as open for public use may be temporarily closed during inclement weather to protect reconstruction investments until those roads have stabilized. A Forest Order would be issued.

3) New drainage structures and those replaced through project reconstruction activities would be designed for 100-year storm events and to provide fish passage as necessary.

4) Easements or Road Use Permits would be obtained before timber haul or reconstruction is initiated in units accessed from identified: haul roads on which easements are not currently held. In order to obtain rights of way, reciprocal agreements may be negotiated with private landowners.

5) Water would be used to abate dust from logging traffic with water selected from water drafting sites that have suitable stream flow and access. When water is scarce, alternative sources such as chlorite, sulfonate or other dust abatement materials may be used.
    a. Existing waterholes and other sites such as ponds, lakes, or streams, used for water drafting would be inspected for existing amphibians and flow levels prior to use. Maximum drawdown volumes would be estimated prior to using draft sites. Minimum pool levels during drafting would be maintained. Drafting sites would be constructed so that oil, diesel fuel, or other spilled pollutants would not enter the stream. Stream bank stability would be maintained and sedimentation minimized by constructing and maintaining back down ramps using rocking, chipping, mulching, or other effective methods. A Forest Service approved screen covered drafting box, or other device to create a low entry velocity, would be used while drafting to minimize removal of aquatic species, including juvenile fish, amphibian egg masses and tadpoles, from aquatic habitats.

Wildlife

1) A limited operating period (LOP), prohibiting activities (except road use and maintenance) would be implemented within ¼ mile radii from nesting sites unless surveys confirm that the species is (are) not nesting to avoid disturbance of nesting pairs:
   - February 15th through September 15th for Northern Goshawk in units: 005a, 005b, 006, 010, 012c, 014, 318-031, 321-004, 322-004, 322-005, 322-006, 322-017, 322-019, 323-021, 323-036, 232-038, 323-039, 324-001, 324-040, 324-056, 325-003, and 325-007
   - March 1st through August 15th for California Spotted owl
     - in units: 318-031, 324-058, 329.044, 323-042, 329-045, 321-005, 324-038, 319-027, 005a, 005b, 009, 018, 034, and 035;

   An LOP may be waived for early season prescribed fire. Based on nesting status, additional mitigation, such as exclusion of portions of the proposed burn/PAC, additional fire lines and different lighting techniques may be implemented to reduce potential effects to nesting spotted owls and goshawks.

2) Elderberry plants greater than 1" in diameter below 3000 feet would be avoided during implementation to protect habitat for elderberry longhorn beetle.

3) Approximately 5% of the area of mastication stands would not be treated, leaving concentrations of trees or brush scattered at various locations within the treatment area in order to provide habitat diversity.

4) Groups or clumps of trees 1- 4 inches in size would be retained throughout thinned areas of stands. Individual trees in these groups should be spaced close enough to one another that their crowns touch or interlock so that they provide horizontal cover for animals.

5) An LOP for all California red-legged frog would be in effect from October 15 to April 15th for activities taking place in units 321-2, 321-4, 325-1, 325-3, 325-7 325-8, 325-9 and 325-10 near Ralston Pond.

Soils

1) To control surface erosion, activities would maintain a minimum of 50% soil cover following mechanical treatments in soils with a low erosion hazard rating and a minimum soil cover of 70% in units with potentially moderate or higher erosion risk (313-03, 317-66, 318-26, 318-33, 321-16, 322-18, 322-19, 322-20, 322-22, 323-17, 323-21, 323-23, 323-26, 323-38, 323-39, 323-41, 323-42, 323-45, 323-47, 324-17, 324-21, 324-33, 324-38, 324-50, 325-04, 325-13, 326-20, 330-22, 330-24) and within RCA's following mechanical treatments.

2) Following prescribed burning operations average soil cover for each treated unit would be maintained at 70% or greater one year following burning activities.

3) Activities would not increase unacceptable soil conditions above 15 percent in the activity area. Approximately 20 acres is planned for ripping following mechanical harvest activities. Landings and skid roads in units 322-22, 323-31, 323-33, 323-37, 323-38, 323-39, 324-33, 325-02, 329-45, 329-46, and 330-23 identified at or near 15 percent soil disturbance would be prioritized for ripping with shanks to alleviate soil compaction and erosion problems, restore infiltration, and discourage unauthorized OHV use. In other thinning units, landings and primary skids leaving landings would be prioritized for ripping based on Sale Administrator review during implementation. Approximately an acre of landings and skid roads on the east side of unit 330-24 would be ripped to alleviate compaction increases in the Big Grizzly Creek Watershed.
    a. The shanks would be lifted where substantial root and bole damage to larger trees would occur.
    b. Ripping would not occur on shallow soils where the displacement of rocks disrupts soil horizons or where there are concerns about the spread of root disease, or damage to tree roots.
    c. Water-barring would occur following ripping.

4) If excess soil displacement occurs during mechanical operations, skid trails would be re-contoured where possible and covered with slash or other organic material to a minimum of 70 percent cover at the conclusion of thinning activities.

5) If during post-fire monitoring of identified inner gorges in units 322-011, 322-018, 322-322-020, 323-021, 323-025, 323-034, 323-035, 323-053, 324-029, 009, 010, 014, 015, 016, and 041 the risk of riling is unacceptable based on assessments of burn characteristics, heterogeneity of ground and surface fuels, distribution of coarse woody material, soil type, surface rock content, and slope characteristics, then erosion controls would be installed using natural organic material, weed free straw and wattles, or lop and scatter and contour falling of pre-commercial trees.

6) If implementation monitoring shows that project activities are likely to increase Erosion Hazard Ratings above a "moderate" rating for an area based on site specific conditions that were not identified during project planning, activities in that area would be halted until mitigation measures to maintain at least a "moderate" rating are implemented.

7) Equipment use would be avoided on shallow soiled areas such as lava caps and granitic outcrops.

Cultural resources

Standard procedures for protecting cultural resources at risk will be followed when activities are located immediately adjacent to cultural resources (Regional PA 2013, Appendix E). The specific protection measures for cultural resources highlighted in the Cultural Resource Report for the project would be followed during all phases of the project.

1) All cultural resource sites in and near treatment units or in proximity to activity areas such as road reconstruction and maintenance work would be flagged or re-flagged for avoidance from ground-disturbing activities prior to project operations so that they can be identified and protected during project activities.

2) Prior to prescribed burn implementation known cultural resource sites would be reflagged. Any additional handline placement for the prescribed understory burning associated with this project would be coordinated with the District Archeologist.

3) Timber harvest adjacent to site boundaries would be conducted as to directionally fell trees away from flagged sites.

4) Mechanized equipment would be excluded from site boundaries, except areas where removal of woody material is specifically approved by the District Archeologist to prevent or minimize effects to archeological resources. With the clearance of the District Archeologist, vegetation within site may be cut by hand and piled outside of the flagged boundaries.

5) Burn piles would be placed away from sites or other cultural resource features, at a distance far enough so as not to adversely affect site features.

6) Hazard tree removal on or in the vicinity of archaeological sites would be coordinated with the District Archeologist, and will follow the guidelines for hazard tree removal included in the programmatic agreement.

7) Existing breaches in ditches may be used to access treatment units. Such breaches would be identified with the help of the District Archeologist.

8) Any equipment moving from one treatment unit or road system to another by driving cross-country would not be driven across archaeological sites.

9) Low intensity prescribed burning would be allowed on select cultural resource sites identified in the Cultural Resource report for the project.

10) Should any previously unrecorded cultural resources be encountered during implementation of this project, all work should immediately cease in that area and the District Archeologist be notified immediately. Work may resume after the site has been cleared by the District Archeologist; provided recommended Standard Protection Measures are implemented.

Range

1) Range facility improvements would be protected during all stages of project implementation.

2) To the extent practicable, a maximum stubble height of 8 inches would be required to facilitate livestock access and foraging in masticated areas.

Herbicide

All appropriate laws, policies, and regulations governing the use of pesticides, as required by the U.S. Environmental Protection Agency, the California Department of Pesticide Regulation, and the Forest Service Policy pertaining to pesticide-use, would be followed. Coordination with the appropriate County Agricultural commissioner would occur, and all required licenses and permits would be obtained prior to any pesticide application.

1) Compliance with the Clean Water Act would be demonstrated through the implementation of Best Management Practices (BMPs) certified by the state, and then monitoring to determine if the appropriate Central Valley Regional Water Control Board standards are met.

2) A directed spray away from conifer seedlings and oaks as well as the use of physical barriers would be required as needed to provide for protection where intermixed in targeted plants.

3) Each treatment unit would be posted with a clearly visible sign along likely access points that the unit has been treated with herbicide to avoid uninformed entry by public or other woods workers immediately after spraying has occurred. The specific herbicide would be identified, the treatment date specified, and the name and phone number of the appropriate contact would be identified.

4) A safety and spill plan would be developed prior to treatment annually, in years that herbicide treatments occur, to address site specific attributes of proposed treatment units, chemicals planned for use that year, and emergency appropriate contact information.

5) Application would cease when weather parameters exceed label requirements, in the event of precipitation, or a forecast of greater than a 70% chance of precipitation in the next 24 hours to reduce the chance of herbicide washing off targeted plants and into the soil.

Monitoring

Sensitive and Invasive Plants

Locations of any new infestations of invasive plants would be mapped, reported to the project botanist, and documented for continued monitoring. Monitoring for new and expanding invasive plants populations would be conducted at treatment sites know to have invasive plant occurrences throughout project implementation and after treatment for 2-3 years depending upon need.

As a precaution these Sensitive plant populations will be monitored by botany personnel to validate conclusion of no adverse effects from herbicide drift where hazard quotients identify risk to known populations.

Wildlife

Known nest sites for California spotted owl and Northern goshawk are visually inspected to determine occupancy where LOPs may be waved.

Water Quality and Soils

Implementation, effectiveness and forensic monitoring of the project would occur as defined in the Central Valley Timber Harvest Waiver Eldorado National Forest Monitoring Plan.

Monitoring of identified treatment areas with high potential for negative burn effects in inner gorges would occur following prescribed burning in these areas.

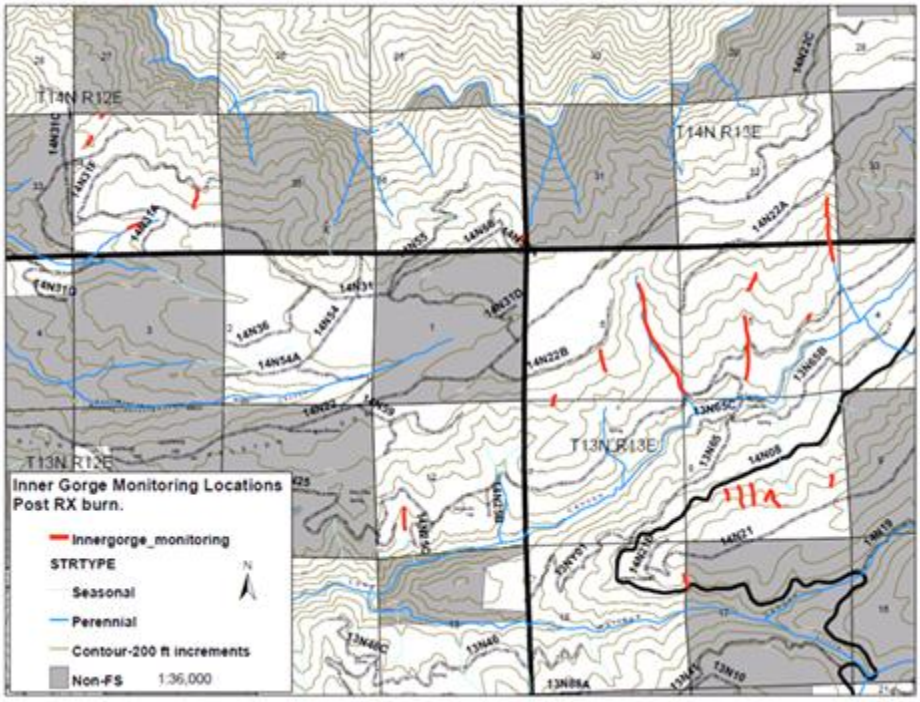

Figure 2 Sites identified for visual post burn monitoring of inner gorge areas to determine if negative fire effects have occurred.

Cultural Resources

The District Cultural Resource Specialist would monitor cultural resource sites to ensure the effectiveness of protection measures.

Comparison of Alternatives

This table provides a brief summary of the alternatives and their environmental impacts in comparative format.

Table 6 Comparison of Proposed Activities for Each Alternative.

	Alternative 2 – No Action	Alternative 1 – Proposed Action	Alternative 3	Alternative 4	Alternative 5
Project Activities					
Road Construction (miles)	0	1.5	1.5	1.2	1.5
Road Reconstruction (miles)	0	41	41	34	41
Mechanical commercial thinning (acres)	0	2,399	0	1,923	2,572
Non-commercial mechanical thinning (acres)	0	20	2,419	20	20
Commercial skyline thinning (acres)	0	57	0	17	57
Tractor piling initial treatment (acres)	0	8	8	8	8
Mastication initial treatment (acres)	0	478	478	478	478
Hand thin and pile or lop and scatter as an initial treatment (acres)	0	195	8	195	195
Prescribed fire initial treatment (acres)	0	3,758	306	3,687	3,649
Herbicide (initial and/or follow-up treatment (acres)	0	360	300	360	360
Planting follow-up treatment (acres)	0	60	0	60	60

	Alternative 2 – No Action	Alternative 1 – Proposed Action	Alternative 3	Alternative 4	Alternative 5
Achievement of Purpose and Need					
Acres of Flame length less than 4 feet immediately after treatment	978	6,692	3,045	6,071	6,783
Acres of Fireline Intensity less than 100 btu/ft/sec immediately after treatment	1,060	111	70	125	114
Acres of Rate of Spread less than 20 chains per hour immediately after treatment	5,359	6,881	3,201	6,282	6,982
Acres of Surface Fire type immediately after treatment	1,057	6,786	3,102	5,965	6,882
Mortality across treatment area during high severity fire after initial treatments	Highest	Reduced from No Action	Reduced from No Action higher than Alternative 1, 4 or 5	Reduced from No Action higher than Alternative 1 or 5	Lowest
Average height to live crown after initial treatments with 1 standard deviation	29	37	32	33	38
Strategic placement of treatments (SPLAT) acres	0	1,673	1,005	1,673	1,711
Increased Protection of California spotted owl PACs	0	Reduced effects in 11 of 19 modeled PACS	Reduced effects in 9 of 19 modeled PACS	Reduced effects in 11 of 19 modeled PACS	Reduced effects in 11 of 19 modeled PACS
Longevity of treatments	N/A	10 years or more	Reduced from Alternative 1	10 years or more	10 years or more
Risk of mortality for residual trees and stands from competition for resources	Highest for all stands	Reduced below a threshold of concern for pine and oak for most treated stands over the long-term	Reduced for individual trees, but above threshold of concern for pine and above threshold of concern for white fir in some stands	Reduced for individual trees and in some stands, but above threshold of concern for pine for some stands	Lowest

	Alternative 2 – No Action	Alternative 1 – Proposed Action	Alternative 3	Alternative 4	Alternative 5
Long-term net basal area accumulation	This alternative results in low basal area accumulation for pine and oak	This alternative results in the highest basal area accumulation for pine and oak and all species combined	This alternative results in the lowest basal area accumulation for pines, oak and all species combined	This alternative results in reduced basal area accumulation for pine, oak and all species combined	This alternative results in reduced basal area accumulation for pine, oak and all species combined
Changes to diameter distributions	Largest increase in the mid-sized diameter classes over the long term.	Increase in largest and smallest diameter classes and decreases in the mid-sized classes over the long term	Least decrease in the largest diameter and smallest diameter classes and most increase in the mid- sized classes over the long term	Increases in the larger diameter classes over time and decreases in mid-size classes	Largest increase in largest and smallest diameter classes and decreases in the mid-sized diameter classes over the long term
Changes to species composition	No improvement. Decrease in pine and oak and increase in shade tolerant species over time	Increase in pine and oak and decrease in shade tolerant species over the long term	Some improvement in proportion of pine and oak in terms of trees per acre over no action. Decrease in pine and oak and increase in shade tolerant species basal are over time	Some improvement in proportion of pine and oak in terms of trees per acre over no action. Decrease in pine and oak and increase in shade tolerant species basal are over time.	Increase in pine and oak. Greatest decrease in shade species trees over the long term
Growth and maintenance of large pines	Not improved	Improved for some individual trees	Little to no improvement for most trees	Improved for some individual trees	Highest
Improved Aquatic and Riparian Habitat	None	Greatest through improvement of road structures and dispersed use sites	Least of action alternatives	Similar to Alternative 1 but potentially less with less road reconstruction occurring	Similar to Alternative 1.
Erosion and sediment delivery	High in event of Wildfire	Low from activities. Lowered in event of wildfire.	Low from activities. Lowered in event of wildfire.	Low from activities. Lowered in event of wildfire.	Low from activities. Lowered in event of wildfire.
Est. Volume Harvest in cubic feet	0	24,237	0	18,977	25,944
Appraised Value	0	$946,212	0	$635,832	$ 1,012,863
Cost of Treatments Directly Associated with Commercial Harvest Units	0	$1,160,605	$1,523,988	$1,027,527	$1,232,414

	Alternative 2 – No Action	Alternative 1 – Proposed Action	Alternative 3	Alternative 4	Alternative 5
Cost of Treatments Not Associated with Commercial Harvest Units	0	$2,437,905	$933,652	$2,374,913	$2,447,597
Effects					
Effects to Plants	No Change	Potential for impact to some individuals and habitat, but not likely to lead toward a trend for listing for any species.	Reduced potential impacts from invasive plants.	Same as Alternative 1	Same as Alternative 1
Effects to Soil	No Change	Increase in compaction and displacement within Forest Plan Standards.	Reduced impact area compared to Alternative 1	Reduced impact area compared to Alternative 1	Greatest impact area. Still expected to be within Forest Plan Standards
Watershed Cumulative Effects	No Change	Below Threshold by 8% in Big Grizzly Watershed. Remaining 12 watersheds are Low to Moderate	Below Threshold by 8% in Big Grizzly Watershed. Remaining watersheds 12 are Low to Moderate	Below Threshold by 8% in Big Grizzly Watershed. Remaining 12 watersheds are Low to Moderate	Below Threshold by 7% in Big Grizzly Watershed. Remaining 12 watersheds are Low to Moderate
Effects to aquatic species	No Effects. Greatest risk for mortality and habitat loss from wildfire.	Some individual foothill yellow-legged frog and western pond turtles may be affected but not likely to lead toward a trend for listing. Potential for improved habitat over time.	Least potential for impacts to individuals or habitat.	Same as Alternative 1 with potentially less immediate and short term impacts.	Same as Alternative 1.
Effects to late seral wildlife species and habitat	No immediate impacts but continued risk of habitat loss from wildfire	Reduced habitat quality expected on commercially thinned acres	Least amount of impact of action alternatives	Reduced impacts by impacting less acreage and reducing intensity of treatment on some acres	Greatest impact
Acres of late seral habitat affected by project activities	0	6,746	3,009	6,231	6,788

	Alternative 2 – No Action	Alternative 1 – Proposed Action	Alternative 3	Alternative 4	Alternative 5
California Spotted Owl Findings	No immediate impacts but highest risk of habitat loss in the event of future wildfire.	Likely to result in a loss of spotted owl territories from the project area. Reduced risk of habitat loss in the event of future wildfire.	Unlikely to result in a loss of spotted owl territories from the project area. Less substantial reduced risk of habitat loss in the event of future wildfire.	Low likelihood of resulting in a loss of territorial spotted owls from the project area. Reduced risk of habitat loss in the event of future wildfire.	Likely to result in a loss of territorial spotted owls from the project area. Reduced risk of habitat loss in the event of future wildfire.
Suitable spotted owl habitat impacted by treatment	0	4,543	2,145	3,958	4,606

Chapter 3. Affected Environment and Environmental Consequences

This Chapter describes aspects of the environment likely to be affected by the proposed action and alternatives. Also described are the environmental effects (direct, indirect, and cumulative) that would result from undertaking the proposed action or alternative. Together, these descriptions form the scientific and analytical basis for the comparison of effects in Chapter 2.

Past, Present, and Reasonably Foreseeable Actions

According to the Council on Environmental Quality (CEQ) NEPA regulations, "cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7). In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

In determining cumulative effects, the effects of past and present and future actions were added to the direct and indirect effects of the proposed action and alternatives. Past, present and reasonably foreseeable activities for the planning area are displayed in Appendix C of this document. It is important to keep in mind that the cumulative effects analysis areas for the various resources are not always identical. For instance, an aquatic environmental analysis might be based on a watershed boundary, while the sensitive plants analysis is tied to a particular set of habitat types and topographic features.

Forest Vegetation

Effects on forest vegetation are summarized from the Silviculture Report for the Blacksmith Project, (Walsh 2013a).

This analysis used four primary sources for the underlying assessment: field reconnaissance of the project area, stand exam sampling of random stands stratified by vegetation type, previous fire history of the area, and the vegetation and digital ortho-photographic layer associated with the Geographic Information System (GIS) at the Eldorado National Forest. Silvicultural treatments for the Proposed Action and alternatives were analyzed using the Forest Vegetation Simulator (FVS) program (USDA Forest Service, 2003, Revised 2006) to portray and provide information for the existing condition and aid in analyzing and predicting the immediate, short and long-term effects of the alternatives for selected vegetation attributes. For the purpose of this project the analysis was done for a thirty year

time frame. Modeling outputs are known to have some variation in their modeling processes, and outputs should be evaluated on relative rather than absolute terms.

Affected Environment

The project area currently does not meet desired conditions due to stand densities, density of shade tolerant trees, and an accumulation of ground and ladder fuels. The project area is characteristic of much of the mixed-conifer zone of the Sierra Nevada with few or no stands remaining that can be described as natural. To various degrees the forest has been changed from one dominated by large, old, widely spaced trees to one with dense, fairly even-aged stands. Past timber harvest and infilling of trees into gaps that were historically created or maintained by fire has resulted in a homogenization of the landscape. Compared to historic conditions stands have fewer old fire-resistant trees, such as ponderosa pine, more stands with multiple canopy layers and high stem densities, a more densely forested landscape with continuous and high fuel levels. Consequently the landscape is more susceptible to stand-replacement wildfire or insect outbreak. Following such disturbance this forest and the species that depend on it are expected to have limited capacity to recover in a reasonable timeframe, if at all given future climate uncertainty.

In sampled stands, the average number of trees per acre was 139. A maximum of 463 trees per acre with a basal area of 272 was sampled. The basal area average for sampled stands was 247 with a maximum basal area of 517 and a corresponding 221 trees per acre. Dependent upon on landscape position, site quality, and available soil moisture, some stands are more capable of carrying higher densities in terms of trees per acre and basal area for longer periods of time, however, many sampled stands exist on ridge top and upper slope positions where the ability of the stands to survive and be resilient to disturbance cannot be maintained at the current densities. Topography is an important predictor of forest species composition and structure (Underwood et al. 2010; Lydersen and North, 2012).

Under an active fire regime, old growth stands were both more common and of higher basal area and large tree density as can be seen in Bouldin (1999), in which he compared 1935 VTM data to more current conditions. It should be noted that fire suppression had already been underway for several decades by 1935, and therefore the number of 4-11 inch trees recorded in 1935 may reflect some fire suppression effects. Causes of change in stand structure have been generally interpreted as being due to fire suppression and timber removal, although some of the decrease in large trees is due to increased rates of death from natural causes.**Error! Reference source not found.** Increases are evident in the trees per acre and the basal area per acre in the smaller 12-23.9 inch dbh class, while the average basal area per acre and basal area in large trees has decreased principally due to decrease in very large ponderosa and sugar pines, but also because of increase in 4-23.9 inch diameter cedar and Douglas fir.

While trees per acre and basal area are important attributes of the stand, species composition is an equally important factor in the resilience of stands to disturbance. The shift in species composition

over time can be partially seen in a comparison of the percentage of basal area by species to the percentage of trees per acre by species in that while ponderosa pine and black oak occupy a larger portion of the basal area (older, larger trees) they dominate less of the trees per acre, which are primarily incense cedar and white fir. Because of the larger number of white fir and cedar on the high productivity sites, they are beginning to also dominate the basal area per acre compared to slower growing areas.

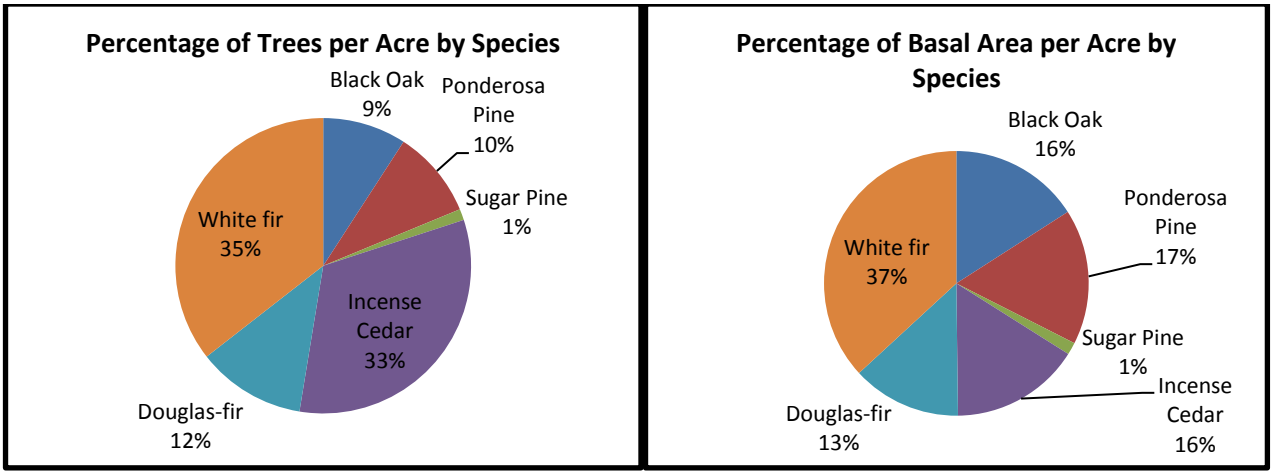

Figure 3 Current Conditions Trees per acre and Basal Area per Acre by species

Most of the health concerns with these timber stands can be tied to overstocked or overcrowded conditions of the stands. Over-dense stands cause a decline in the general health and vigor of all tree species due to high competition for moisture, sunlight, and nutrients. As a result, stands are less resistant to insect and disease-related attack, especially during periods of extended drought, which then increases the potential for extreme fire behavior in the area. Due to changes in forest density, understory composition, and tree species which are emerging to replace those in the existing forest canopy, the forests that are now developing will be distinctly more susceptible to insect and disease, drought, and catastrophic fire than those in the past (MacCleery, 1995).

Sampled stands had an average stand density index of 343 which is below a threshold of concern for white fir, but above the 60% threshold of concern for ponderosa pine and California black oak, indicating that these species are at increased risk for competition related mortality in a majority of stands proposed for treatment. Maximum stand densities sampled were 712 and more than 20% if sampled stands were above a 60% threshold of concern for white fir indicating that a proportion of stands are at a high level of risk of imminent mortality.

Bark beetles are considered the most consequential insects in western coniferous forest, where they kill millions of trees annually. The true fir and Douglas-fir principal beetles of concern are Douglas-fir tussock moth, western spruce budworm, bark beetles, fir engraver beetle, and roundheaded fir borer. For pines, the most damaging insects are western pine beetle, the mountain pine beetle, the red

turpentine beetle, and the California five spine-ips. Forest Health Monitoring identified risk is defined as a 25 percent or more volume loss over the next 15 years including background mortality. The Regional Risk Map uses Existing Vegetation Data (EVEG, USDA Forest Service, Region 5, Remote Sensing Laboratory) and CA-GAP data sets as the vegetation base layers for host type at a spatial resolution of 30 meters. According to this mapping 15,775 acres (54% of the planning area) have been identified as at risk.

Environmental Consequences

Alternative 2

Direct & Indirect Effects

No activities would be undertaken with this alternative. Direct impacts from project related activities would not occur to vegetation resources in the project area. There would be no thinning of suppressed, intermediate, and codominant conifers with the project. There would be no reduction of competing brush cover or reduction of tree density. The continued susceptibility of the area to adverse wildfire effects from high fire hazard potential and insect and disease mortality endangers the long-term sustainability of the stands. No Action is still a management decision and would have indirect consequences to forest vegetation resources. This alternative is not expected to result in achievement of Desired Future Conditions in many of the stands in the project area over time to the extent that they remain at risk for high severity wildfire, high levels of insect mortality, and a species composition that is trending away from the Desired Future Conditions.

Heterogeneity

Compared to Alternative 1, more of the landscape managed by the Eldorado National Forest would continue to be uniform non-treatment areas, with higher densities of trees. Continued loss of desired residual trees is expected at a faster rate than with Alternative 1 reducing the number of large trees on the landscape. Stands containing valuable "remnant" ponderosa and sugar pine that would have historically survived light intensity burns would likely be killed, and the risk of permanent site damage and alteration of species composition would increase.

Trees per Acre, Basal Area and Diameter

The number of trees per acre would fluctuate over time as trees establish and die within the stands. Basal area and average diameter are expected to increase as existing trees within the stand grow until mortality from wildfire or insect causes a large proportion of large trees within the stands to die. While some large trees within the stand would continue to grow, growth is expected to be slower for these trees than it would be with the proposed thinning activities due to reduced availability for resources such as water and nutrients. Higher basal area modeled in untreated stands is a factor of more trees per acre rather than larger trees within these stands.

In the absence of disturbance, the proportion of trees in the smaller diameter classes is expected to decrease over time while trees in the upper diameter classes are expected to increase. Increases in the

largest diameter class are expected to be reduced from Alternative 1 while trees per acre in the medium sized classes are expected to retain more trees per acre. Given the current risk to stands, disturbance such as drought, high beetle activity, or wildfire in these untreated stands over the modeled period is likely.

Canopy Cover

Canopy cover in treatment units would not decrease as a result of no action in the short-term. In the long-term canopy cover is expected to gradually increase then remain constant until mortality exceeds growth and establishment of trees within these stands. CWHR Class of stands is expected to remain unchanged over the short-term. In the long-term it is expected that some additional stands would move into the 4D density classification in the absence of a wildfire or insect outbreak.

Understory

In the absence of fire it is expected that more open areas of stands would continue to experience increases in canopy cover and fuel loading, continuing to reduce understory populations due to shading and build-up of surface fuels. Stands with heavy brush competition are expected to have brush become more decedent. This would not be expected to open additional growing space for other grasses and forbs. Areas where canopy cover is declining are expected to have an increase in brush establishment and growth over time. In the event of a wildlife, an increase in grasses and forbs could be expected.

Defect trees, Snags, and Down Logs

Trees with defects valuable for wildlife use would not be affected. The number of snags and down logs is expected to increase over the long-term, primarily due to mortality caused by insect and disease. Down logs 12 inches and larger would only slightly increase due to normal snag fall. The recruitment rate of snags and down logs would continue to be dependent upon the interplay of precipitation levels, stand density and other natural elements, such as the incidence of insect attack, natural mortality, and amounts of windthrow. The general upward trend expected in snags and down logs would continue until conditions suitable for tree growth improve. Should a wildfire occur it could potentially create a tremendous number of new snags and down logs while consuming existing snags and down logs.

FVS projections show that the number of snags per acre greater than 16” dbh is expected to continue to increase over time with no activities. Modeling is believed to most likely under-predict the number of snags that will result over the next several decades as it did not include parameters for Annosus related mortality in white fir or for the current drought and insect related mortality that has been evidenced as increasing on the Georgetown Ranger District and within the project area within the last few years.

Growth and Competition

Stand density as measured by Stand Density Index currently averages 353; meaning stands are at 62% of the maximum density (571) for Ponderosa pine and at 48% of maximum density for white fir. Twenty percent of stands currently identified as at above a threshold of concern for white fir mortality

would remain at high risk of loss while stand density in lower density stands would continue to increase into the future putting desired species such as ponderosa pine, sugar pine, and California black oak at a higher risk for mortality.

Increased stand density results in higher basal area per acre growth of all tree species combined, however competition results in increased mortality for all species and reduced growth for ponderosa and sugar pine over the modeled period. Net cumulative growth for the modeled period for all species with no action is 35.5 square feet of basal area, 2.4 square feet less than the Alternative 1 with cumulative mortality more than 36 square feet per acre higher for the modeled timeframe. Ponderosa and sugar pine respectively have a reduction in net accumulated growth compared to Alternative 1.

Species Composition

Incense cedar, white fir and Douglas-fir (shade tolerant species) would continue to dominate the understory layer, while oaks, ponderosa and sugar pine would continue to be displaced. This is simply because these shade tolerant species are more successful at regenerating in the absence of canopy openings created by fire or timber harvest. Given that these areas already have a limited supply of moisture and nutrients, excessive numbers of trees further limits their productivity. Without fire to modify stand structures and compositions, insects and disease would act as the agents of control as these stands continue to become more overstocked and stressed with unnatural amounts of fuel build up.

Release of California black oak from overtopping conifers would not occur and in denser stands oaks are expected to be continued to be overtopped and crowded out by competing conifer species. The number and proportion of shade tolerant trees is expected to increase over time and the proportion of Ponderosa pine, sugar pine and hardwoods, as measured in both trees per acre and basal area per acre are expected to decrease.

Cumulative Effects:

Because no direct impacts would result from project related activities, no cumulative effects to forest vegetation are expected from implementation of Alternative 2 other than the continuation of the effects of fire suppression and historical management practices. Under Alternative 2, it is assumed that fires would continue to be suppressed. As previously stated the fire interval in the project area has already been altered, with fires all but eliminated in the area since the early 1900s except for the fires that have escaped control and burned with higher severity results. Since fire is the primary mechanism that controlled forest structure and composition, it is safe to assume that other components of the ecosystem have likewise been altered.

Alternative 1

Direct & Indirect Effects

Heterogeneity

Within stands proposed for mechanical treatment, prescriptions would provide for a more sustainable structure. Prescriptions would allow stand trajectory to be changed to favor a larger composition of shade intolerant pine and hardwood through thinning between identified retention areas with varied intensities based on topography, stand characteristics and treatment objectives. Management of tree and stand density would enhance development of larger trees, alter the clumpiness of the stand, remove canopy to lower crown interaction or open the canopy to entice tree growth with fuller crowns.

While averages are used to describe stand conditions both pre and post treatment, there is not an effort to create average conditions in any location. Strategies in Alternative 1 to provide for retention and removal of clusters of trees should encourage a more clumpy distribution of age and size classes within treated stands. By creating small openings, new cohorts of desired species would be established and add to future structure. Retention of structures within micro-sites that support higher basal area and of areas that provide important structure for wildlife use is expected to preserve some vertical diversity within proposed treatment units. Thinning would encourage spatial separation of different strata. Age and size class differences that are present pre-treatment would continue to be present post treatment, although abundance would be modified.

Prescribe burning, mastication and precommercial thinning treatments are not likely to have large impacts on, within, or between stand heterogeneity. These treatments will provide for some variation in the density and structure of vegetation within stands, especially in understory vegetation.

Trees per acre, Basal Area and Diameter

As a direct result of harvest, the number of trees per acre and basal area per acre would be immediately reduced in mechanically thinned stands. Because the majority of trees proposed for thinning are in the smaller diameter classes, average quadratic mean diameter (QMD) would immediately increase. Because establishment and ingrowth is expected to continue, the number of trees per acre and QMD are expected to fluctuate over the timeframe of treatments, while basal area is expected to increase as more growth is concentrated on larger trees in the stands. Prescribed burning is expected to further reduce the number of trees per acre and basal area, although the exact changes are subjective in terms of the modeled outcomes. In non-commercial units, mastication and precommercial thinning would reduce the number of trees per acre in the smaller size classes (<8 inches), however these reductions are not expected to result in measurable changes in basal area per acre or QMD. Basal area removals average 60 square feet or 25% of the existing basal area with a maximum basal area removal of 57%. Within the average conditions projected after treatment, the number of trees per acre, basal area per acre and QMD are expected to differ based on the variable density prescriptions for removal and retention within individual stands.

The residual stand structure after treatment is based on the quality of the stand retained rather than the material removed. In order to move stands toward desired conditions, under this alternative ninety percent of the proposed removal is in trees below 20 inches dbh.

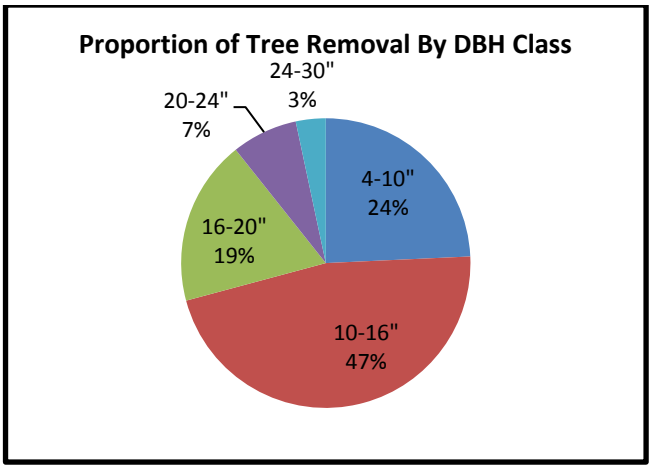

Figure 4 Percentage of proposed tree removal by DBH Class

Compared to current stand conditions, a reduction in smaller diameter classes would be evident in the years immediately after treatment. In the short and long term the numbers of trees per acre in the larger diameter classes are expected to increase. Trees per acre in the smaller diameter classes are expected to decrease as a result of follow-up burn treatments and the faster movement of trees from smaller to larger diameter classes.

Canopy Cover

Canopy cover in mechanical thinning units would decrease as a result of management actions in the short-term. In the long-term, canopy cover is expected to gradually increase and move towards or above pre-treatment with the growth of residual trees. Changes in the percentage of canopy cover would vary within mechanical thinning units. Since most of the trees that are removed are in the understory and smaller diameter classes, the overall reduction in canopy cover would not be proportionate to the reduction in the number of trees or basal area.

For some stands, canopy cover would be virtually unchanged, while for others, particularly those areas dominated by trees less than 20 inches dbh, the decrease would be greater. Measured decreases in canopy cover from application of the thinning prescription, as modeled in FVS, are expected to be approximately 9% and range from a minimum reduction in some modeled units to a maximum modeled reduction of 28%. Prescribed burn activities are expected to further reduce canopy cover by about 5%. In the vast majority of stands monitored for canopy cover following thinning treatments on the Georgetown District of the Eldorado National Forest, we have found that canopy cover has consistently been about 10% higher following thinning than projected with FVS modeling. Therefore it is likely that average canopy would be higher after treatment than depicted. Canopy cover is not

expected to be uniform after treatment. Averages for differing variable density management areas post thinning show a range of average canopy conditions that are expected to result.

Decreases in canopy cover over time can primarily be seen in the 10-20 inch diameter size class, as this is where the majority of removal affects average stand canopy cover. The 4-10 inch class, which represents a larger portion of the trees per acre removed, rarely contributes much to canopy cover. Canopy cover in the largest diameter class is expected to increase over time, indicating that a higher proportion of stands would be moving toward a CWHR classification of 5.

Only minor reduction to canopy cover from prescribe burning, mastication and precommercial thinning are likely to occur, because these treatments do not target overstory trees. Mastication, precommercial thinning and prescribed fire only treatments are also expected to have very limited effects on CWHR.

Understory

Proposed treatment activities are expected to benefit the regeneration and growth of grasses, forbs, and brush species in the understory, increasing the amount of area occupied by these plants within treatment units. Canopy cover reductions from proposed thinning would increase the amount of light hitting the forest floor aiding in establishment and survival of understory vegetation. Tractor piling and prescribe burning are expected to increase the amount of growing space available to understory plants. Prescribe burning is also likely to stimulate sprouting in some species. Herbicide treatments would reduce brush cover in stands treated with herbicide. Reductions in brush cover are expected to benefit grasses and forbs in these areas.

Defect Trees, Snags, and Down Logs

Retention of trees with defect that are identified as valuable for wildlife use is not expected to reduce the genetic quality of the stand as genetic forks usually occur lower on the tree and do not typically provide for structures that are beneficial for wildlife use. Some reduction in trees providing microhabitat can be expected in the smaller diameter classes <20 inches, however it is not expected that proposed variable density thin treatments with identification for retention of these specific characteristics in trees greater than 16 inches, would result in large decreases in these microhabitats. This is because even without specifically identifying these trees for retention, many of the trees with wildlife use characteristics are in the larger diameter classes and in the overstory of the stand.

Some incidental reduction in the number of existing snags is expected as a result from hazard tree falling. Short-term direct effects upon snags and down logs are also likely to occur as part of the prescribed fire, machine piling and pile burning activities. The specific number of created or lost snags and down logs is difficult to predict because of variations in tree age, size, fuel moisture levels, duff depth, and location of snags and down logs within the treatment areas. Down logs have been shown to

decrease in density, piece size and shift toward less decayed pieces with thinning and burning (Innes et al., 2006)

It is anticipated that some additional snags would be created through prescribed and pile fires, and that down logs would be increased by snags that fall. Harrod et al (2009) showed that the number of snags per acre and the basal area of snags per acre increased in thinned and burned stands compared to no treatment. Innes et al. (2006) found that CASPO thins with and without prescribed burning increased the volume and mass of large snags (>17 inches dbh) but decreased the density (although not statistically significant), indicating that large snags were recruited, but that the frequency of these structures dropped across the landscape. Personal observation during post treatment monitoring on units within the Quintette, Cement Hill, and Smarty Jones projects that have been thinned and burned have confirmed that large snags immediately increased slightly on some acres as a result of project activities.

Using the FVS, projections for future snags show that the numbers of snags per acre greater than 16 inches in dbh are expected to increase in the short-term, likely due to the combination of treatment activities and current stresses on trees within the stand. Compared to Alternative 2, snag numbers are reduced over the long term and from current numbers. This is a result of the fact that Alternative 2, current snags are not replaced as rapidly by newly dead trees as larger trees are expected to survive farther into the future. Based on modeling predictions, snag numbers would continue to exceed Forest Plan standards into the future.

Growth and Competition

By removing some of the smaller trees growth is concentrated on larger trees allowing them to develop more rapidly. Growth of ponderosa and sugar pine is expected to increase with Alternative 1 while mortality of these trees is expected to decrease. Over time this means that more basal area from ponderosa and sugar pine will contribute to stand structure. Based on modeling outcomes for all species combined within stands, stands would experience reduced basal area growth due to fewer trees per acre and increased survival. Treatment however would also reduce mortality within these stands which results in a net increase in growth over time within these stands compared to Alternative 2 and treatment alternatives with reduced removal intensity. Burn treatments modeled to occur in 2016 create a spike in mortality to all species above the projected mortality with the no action as an immediate result resulting in short-term higher net growth with Alternative 2; however after thinning and burn treatments are completed, mortality is expected to be substantially lower with proposed treatments than with no treatment. Net growth over the modeled period with Alternative 1 is 37.9 square feet of basal area per acre for all species.

Reduction in competition to plantation trees through removal of competing brush and reduced tree density is expected to increase height and diameter growth, and reduce the risk of mortality from wildfire and insect attack. Brush competition within ponderosa pine plantations in California has been

shown to significantly reduce height growth and to consistently reduce basal area growth (Barrett, 1982). Oliver (1984) found that brush cover above 30% overwhelmed any inter-tree competition due to spacing, slowing growth of all plantation trees. Trees are not expected to immediately increase their rate of growth after treatment; however within 5 years the rate of stem volume production and height growth are expected to appreciably increase with increased availability of nutrients and water. As a result trees are expected to reach canopy closure considerably sooner than with no treatment.

Stand density as measured by Stand Density Index currently averages 353 meaning they are at 62% of the maximum density (571) for Ponderosa pine. Within the proposed treatment areas, reduction in tree numbers and stand densities through harvest would reduce the competition between trees thereby improving residual tree health. The majority of the mortality that is captured through the implementation of Alternative 1 is in the 1-16 inch diameter ranges. Alternative 1 is expected to reduce the average density, as measured by Stand Density Index (SDI) to 266, approximately 47% of the maximum density for pine. With implementation of follow-up burn activities, these stands are expected to remain below the threshold of concern for the long-term and have reduced risk compared to the No Action. Density is expected to vary across stands following treatment.

Within treated areas, selectively thinning around individual oak and pine would likely increase the amount of resources to those trees, even where average densities are not substantially affected so long as sufficient thinning occurs in proximity to those trees. High density areas of stands and burn only units are expected to have improved vigor and reduced risk of insect induced mortality due to some reduction in competition for resources compared to Alternative 2. However, as SDI increases over the short and long term these stands will have continued increased risk of mortality. Treatment of neighboring areas may help alleviate some of the risk to these areas, as large blocks of high density would be reduced through treatment.

The body of forestry research shows how thinning stands helps reduce the incidence of pest damage to the stand (Cochran and Barrett, 1995). Less competition increases the health and vigor of the remaining trees, leading to a reduction of risk to bark beetle attack. As trees grow, spatially trees become crowded and fewer resources are available for each individual tree leading to a decrease in tree and overall stand vigor. Reductions in stand density increase resources available to residual trees. Increased resource availability leads to increased tree growth rates thereby enhancing the development of large trees, adding to the vigor of residual trees (greater crown mass for photosynthesis), which results in a proportional increase in overall stand health. The increase in stand health reduces the susceptibility of the stand to insects, drought and disease. Studies have found that growth in large older trees increases significantly when high densities of adjacent small stems are removed (Latham and Tappeiner, 2002). The lower the basal area, the faster individual trees will grow. In stands with lower basal area, individual trees generally have larger diameter and larger crowns indicating a higher level of vigor compared to stands with high basal area. However it should be noted that increases in vigor and growth are not expected to result immediately after reductions in density occur as residual trees in

overstock stands may need to grow additional roots and leaves to capture newly available resources. It is expected that it will take approximately 3 to 5 years after thinning before increases in growth and vigor are fully realized.

There has been some research that has shown some increase in mortality to larger diameter pines after burning treatments, which has the potential to impact ability to meet stated objectives. Maloney et al. (Maloney et al, 2008) showed an increase in beetle attack to residual Jeffery and Sugar pine in treatment units in burn treatments. While some mortality can be expected, high levels of loss of these desired residual trees are not expected based on experience with thinning and follow-up burn projects on the Georgetown Ranger District within the last 10 years, including treatment units completed on the Sundawg project, the Grey Eagle project, the Rockeye project, the Hey Joe project, and the Smarty Jones project. None of these recent projects have resulted in substantial levels of loss of the larger desired residual pine component. Although some insect mortality has occurred as a result of additional stress to the trees from burning, this mortality has typically been concentrated near landing piles or where excessive radiant heat has caused damage. The Quintette project did result in some undesirable loss of large pines in areas of units prescribed understory burned following understory thinning. This mortality has been attributed to cambial damage from burning of duff buildup around the base of large trees in concert with beetle activity present in the area (Report SSA 13-4). Raking of legacy pine proposed with the Blacksmith project is expected to reduce the risk of loss of these trees from burn activities to desirable levels for retention of these trees.

While unacceptable loss of these desired residual trees is not expected in thinned units, it is possible that burn only units may experience loss of more of these desired residual trees if trees are damaged during burn activities as stand densities of residual trees would remain higher and trees are more stressed from competition for resources. However, cooler burn prescriptions in these burn only units are expected to minimize damage to residual trees and reduce this risk. Additionally, thinning of trees with piling of thinned material has some increased risk for residual stands in the short-term as beetles have the potential to use thinned material for a brood source until this material dries. Depending on the season of cutting, beetles may spread from piled material into neighboring residual trees. Risk to residual trees is greatest near large landing piles; however attacks resulting from insects that use piles as a brood source is not expected to occur at a level that compromises achievement of management goals.

Species Composition

Proposed treatments will immediately decrease the number and proportion of shade tolerant incense-cedar, white fir and Douglas-fir, and increase the relative proportion of Ponderosa pine, sugar pine and hardwoods, as measured in both trees per acre and basal area per acre. Over time the proportion of the stand occupied by shade tolerant species is expected to increase as growth on existing trees and re-establishment occurs. Zald et al. (2008) found that thinning and burning treatments produced resource conditions generally favoring pine recruitment, however persistence of micro-sites favorable to shade-

tolerant species and heavy natural seeding by these shade-tolerant species worked against shifting future forest composition to pine. These authors found that prescribed burning alone in wetter controllable conditions failed to significantly reduce fuels or change stand composition, having little impact on canopy cover and understory light conditions. However thinning combined with prescribe fire did significantly affect stand conditions and the type of tree regeneration. Therefore, some shade intolerant pine and oak is expected to establish within open areas created through thinning, however establishment will be patchy. Release of advanced oak and pine regeneration will also occur through proposed treatments.

Release of California black oak from overtopping conifers is expected to increase the vigor of individual oak trees. Oak species and other hardwoods greater than 4-inches are not designated for treatment; however, some minor damage may occur to individual trees during treatment activities. Some hardwoods may be removed to facilitate skid trail and landing location, while others may be damaged during the removal of neighboring conifers. It is expected that there will be some loss of individual oak trees through machine piling and burning. Immature oak species may be severely damaged by relatively hot prescribed fires. Fire may weaken the stem and make the oak more susceptible to pathogens. However, burning also provides a beneficial effect by removing pests that infest the acorn crop and by removing competing vegetation. In addition, root crown sprouting of hardwoods is expected to occur.

Cumulative Effects

Alternative 1, in addition to other projects in the area would improve forest health by moving stands toward a condition that is closer to that of a forest with an active fire regime. This project in conjunction with other planned and ongoing projects in the area would enable the forest to better meet desired conditions for this landscape. With this and other projects in the area, the project area landscape would be managed as more of a mosaic. This would allow greater variation in stand age, species composition, structure and function, thus providing additional resilience against insect or disease, and resilience of the stands following fire.

Treatment with Alternative 1 is not expected to change the vegetation typing or size class measure over a majority of the project area. Mechanical thinning activities would reduce the trend of treated stands toward species dominance by shade tolerant white fir, Douglas-fir and incense cedar. Some ponderosa pine stands that have been classified as Sierra Mixed conifer as a result of in-growth of shade tolerant species may be converted back to ponderosa pine type. In the long term it is expected some of the plantation stands identified as Ponderosa pine would be converted to Sierra Mixed Conifer as a result of silvicultural practices. Additionally, benefits to oaks from treatment are expected to decrease the trend of declining oak within the project area. However, the majority of stands in this landscape managed as part of the National Forest System would not be modified through this project.

It is expected that this project would not contribute to the trend of declining large trees (greater than 30 inches dbh) within the project area, that has resulted from past harvest practices and mortality of larger trees removed in salvage operations, and that this project may increase the longevity of some of these trees.

This project is expected to alter some snag and down log location and distribution within the project area, however, this project is not expected to contribute to a decrease in these structures that resulted mainly from past treatment practices.

Alternative 3

Direct & Indirect Effects

While this alternative does meet some elements of the purpose and need for the project, it's achievement of the purpose and need elements are the least of all the action alternatives. The reduced achievement of purpose and need elements is due to the fact that there is reduced release of shade intolerant oak and pine, reduced stand resilience to insect and disease due to maintenance of high density stand conditions that make these stands susceptible to drought, insects, and disease, and because there is not likely funding that would be reprioritized to this project over the multiple projects on the Forest, it is probable that treatments would not occur over a sufficient portion of the landscape with this alternative. This alternative provides the least efficient and cost effective manner of treatments, which does not assure that sufficient treatment will occur across the landscape.

Heterogeneity

Compared to Alternative 1, more of the landscape would continue to be managed as uniform non-treatment areas, with higher densities of trees. Landscape positions treated with commercial thinning under Alternative 1 would continue to be treated under Alternative 3, however landscape position would not be used to vary treatment intensity or vary emphasis on species composition, which does not allow for implementation of ecological restoration concepts in PSW GTR-220 or GTR-237.

Trees per Acre, Basal Area and Diameter

The number of trees per acre and basal area per acre would be immediately reduced through thinning and burning activities, though not as much as with Alternative 1. The number of trees per acre would fluctuate over time as trees continue to establish and die within the stands. Basal area and average diameter is expected to increase as existing trees within the stand grow until mortality from wildfire or insect causes a large proportion of large trees within the stands to die. While some large trees within the stand would continue to grow, growth is expected to be slower for these trees than it would be with the proposed thinning activities.

Like Alternative 1, stand structures after treatment are expected to differ based on current stand structure, however, stand management would not be varied by topographic position. The areas

managed for lower density under the variable density prescriptions under Alternative 1 would have the greatest retention of trees per acre and basal area in the short term under Alternative 3.

Because only trees in the lowest canopy positions would be removed to achieve minimum fuels objectives 100% of the removal is estimated to be concentrated in size classes less than 20 inches. There would be some incidental removal of trees above 12 inches dbh to facilitate operability; however this removal is not expected to have more than minor alterations to stand structures.

Over time the proportion of trees in the smaller diameter classes are expected to decrease while trees in the upper diameter classes are expected to increase. Increases in the largest diameter class are expected to be reduced from Alternative 1 while trees per acre in the medium sized classes are expected to retain more trees per acre.

Canopy Cover

Canopy cover in treatment units would decrease as a result of management actions; however decreases would be less than with Alternative 1. In the long-term canopy cover is expected to gradually increase. Canopy cover is not expected to be uniform after treatment.

Because the smaller trees that would be removed in this alternative contribute little to canopy cover within stands, only minor decreases can be seen in the canopy cover contributed by any size class. Over time it is anticipated that canopy cover contributed by smaller trees would continue to decline due to mortality and increase in size of residual trees. Likely some CWHR density classes would be reduced through thinning where stands are at the lower end of the canopy cover measure prior to thinning; however the majority of CWHR Class of stands is expected to remain unchanged over the short-term. In the long-term it is expected that some additional stands would move into the 4D and 5D classification. The move into size class 5 is expected to be slower for some stands than it would have been in Alternative 1.

Understory

The removal of surface fuels and smaller trees may increase the proportion of understory plants in areas where dense fuel loads prohibit growth of these plants, however with minor changes in canopy cover expected with this alternative, it is not likely that substantial areas of understory plant regeneration or brush regrowth would occur.

Defect Trees, Snags and Down logs

Reduction in trees providing microhabitat is expected to be less than with Alternative 1. Some incidental reduction in the number of existing snags is still expected as a result from hazard tree falling. Short-term direct effects upon snags and down logs are also still likely to occur as part of the prescribed fire, machine piling and pile burning activities. Snag numbers are expected to be higher in the short and long term with Alternative 3 than with Alternative 1 due to increased, but lower than no action due to a lack mortality related to implementation.

Growth and Competition

By removing some of the smaller trees, growth would be concentrated on larger trees however net basal area growth would be reduced from Alternative 1 for sugar pine, ponderosa pine, and for all species combined, and basal area mortality would be increased. After thinning and burn treatments are completed, mortality is expected to be lower than with no treatment. Net growth over the modeled period with Alternative 3 is 21.4 square feet of basal area per acre for all species, which is less than the modeled growth in either the proposed or Alternative 2. Because thinning treatments are not expected to be sufficient to measurably increase resource availability to residual trees, basal area growth is not able to outpace basal area mortality in these stands.

Stand density as measured by Stand Density Index within the proposed treatment areas would be reduced, though less than with Alternative 1, reducing the competition between trees thereby improving residual tree health. Alternative 3 is expected to reduce the average density, as measured by Stand Density Index (SDI) to 346, approximately 60% of the maximum density for pine, which is at the threshold of concern for that species. With implementation of follow-up burn activities, these stands are expected to remain below the threshold of concern for the short-term and have reduced risk compared to the No Action, however over time average SDI is expected to increase above current values indicating that in the long term desirable pine and oaks within these stands remain at risk.

It is still probable that some individual trees will experience additional resource availability due to thinning of small trees in these stands; however the light degree of thinning is not expected to considerably increase resilience at the stand level. Density is expected to continue to vary across stands following treatment, as shown by tree per acre and basal area values for differing management areas under Alternative 1. This indicates that denser areas of stands, areas that on average will remain 70% if maximum density for ponderosa pine stands will remain at increased risk for mortality of pines and oaks. Higher density areas would also remain, on average at the threshold of concern for white fir.

Species Composition

Increases in mortality to larger diameter pines after burning treatments is not expected to be measurably different than with Alternative 1 as burn treatments typically would occur sooner than trees would be able to take advantage of additional resources. In the short and long term these trees would continue to have high competition for resources and would remain at a higher risk of loss. Proposed treatments would slightly reduce the proportion of incense cedar and increase the proportion of pine in terms of trees per acre; however the proportion of stands occupied by white fir would increase, perpetuating an unsustainable and undesirable condition in upper slope and ridge top stands. Release of California black oak from overtopping conifers would not occur. The proportion of pine and oak in stands is expected to continue to decrease as the proportion of shade tolerant white-fir, Douglas-fir, and cedar are expected to increase.

Cumulative Effects

Treatment with Alternative 3 is not expected to change the vegetation typing or size class measure over a majority of the project area. Benefits to oaks from treatment are not expected to decrease the trend of declining oak within the project area. It is expected that this project would not measurably contribute to the trend of declining large trees (greater than 30 inches dbh) within the project area, that has resulted from past harvest practices and mortality of larger trees removed in salvage operations. This project is expected to alter some snag and down log location and distribution within the project area, however, this project is not expected to contribute to a decrease in these structures that resulted mainly from past treatment practices.

Alternative 4

Direct & Indirect Effects

Heterogeneity

Compared to Alternative 1, more of the landscape would continue to be managed as uniform non-treatment areas, with higher densities of trees. Some stands treated with variable density commercial thinning under Alternative 1 would continue to be treated under Alternative 4 and in these stands landscape position would continue to be used to vary treatment intensity and emphasis on species composition.

Trees per Acre, Basal Area and Diameter

The number of trees per acre and basal area per acre would be immediately reduced through thinning and burning activities, though not as much as with Alternative 1. The number of trees per acre would fluctuate over time as trees continue to establish and die within the stands. Basal area and average diameter is expected to increase as existing trees within the stand grow until mortality from wildfire or insect causes a large proportion of large trees within the stands to die. While some large trees within the stand would continue to grow, growth is expected to be slower for these trees than it would be with the proposed thinning activities. On average this alternative would remove 23 square feet of basal area or 10% of the existing basal area from current stands with a maximum reduction of 57%.

Like Alternative 1, within the average conditions projected after treatment structures are expected to differ based on current stand structure. Management for variable density would be varied by topographic position in stands commercially thinned. Approximately 556 acres would continue to retain higher stand densities into the future than with Alternative 1.

Because thinning is focused in stands with lower density and smaller trees, 95% of removal is expected to occur in diameter classes smaller than 20 inches. Over time the proportion of trees in the smaller diameter classes are expected to decrease while trees in the upper diameter classes are expected to increase. Increases in the largest diameter class are expected to be reduced from Alternative 1 while trees per acre in the medium sized classes are expected to retain more trees per acre.

Canopy Cover

Canopy cover in treatment units would decrease as a result of management actions; however decreases would be less than with Alternative 1. In the long-term canopy cover is expected to gradually increase. Average change in canopy cover from thinning activities is 4% with a 22% maximum projected change. Canopy cover would vary across treated stands and would be reduced in commercial thin units similar to Alternative 1 average, however areas that would not be would higher average canopy cover.

Because the smaller trees that would be removed in this alternative contribute little to canopy cover within stands, only minor decreases can be seen in the canopy cover contributed by any size class. Over time it is anticipated that canopy cover contributed by smaller trees would continue to decline due to mortality and increase in size of residual trees. Likely some CWHR density classes would be reduced through thinning where stands are at the lower end of the canopy cover measure prior to thinning; however the majority of CWHR Class of stands is expected to remain unchanged over the short-term. In the long-term it is expected that some additional stands would move into the 4D and 5D classification. The move into size class 5 is expected to be slower for some stands than it would have been in Alternative 1.

Understory

In areas treated the same as Alternative 1 it is expected that effects would be the same as described. In areas where treatment intensity is reduced, the removal of surface fuels and smaller trees may increase the proportion of understory plants in areas where dense fuel loads prohibit growth of these plants, however with minor changes in canopy cover expected with this alternative, it is not likely that substantial areas of understory plant regeneration or brush regrowth would occur.

Defect Trees, Snags and Down logs

Reduction in trees providing microhabitat is expected to be less than with Alternative 1. Some incidental reduction in the number of existing snags is still expected as a result from hazard tree falling. Short-term direct effects upon snags and down logs are also still likely to occur as part of the prescribed fire, machine piling and pile burning activities. The combination of mortality from implementation and mortality from retention of high density areas creates a situation where snag numbers are expected to be higher in the short and long term with Alternative 4 than with Alternative 1, but lower than no action.

Growth and Competition

By removing some of the smaller trees growth would be concentrated on larger trees however net basal area growth would be reduced from Alternative 1 for ponderosa pine and for all species combined, and basal area mortality would be increased. Sugar pine is shown to experience slightly higher basal area growth and less mortality than with Alternative 1, although this could be a misrepresentation of trees with blister rust removed under Alternative 1 continuing to grow in the model where stands are not commercially thinned, where in actual stands these trees would continue to

decline in health. Net basal area growth over the modeled period with Alternative 4 is 28.1 square feet of basal area per acre for all species, which is less than either Alternative 1 or Alternative 2. Thinning treatments are not expected to be sufficient to measurably increase resource availability to residual trees so basal area growth is not able to outpace basal area mortality in stands with reduced treatment intensity.

Stand density as measured by Stand Density Index within the proposed treatment areas would be reduced, reducing the competition between trees thereby improving residual tree health, though less than with Alternative 1. Alternative 4 is expected to reduce the average density, as measured by Stand Density Index (SDI) to 319, approximately 56% of the maximum density for pine, which is near the threshold of concern for that species. With implementation of follow-up burn activities, these stands are expected to remain below the threshold of concern for the short-term and have reduced risk compared to the No Action. Over the modeling period average SDI is expected to increase above current values.

In stands treated less intensively than under Alternative 1, it is still probable that some individual trees will experience additional resource availability due to thinning of small trees, however the light degree of thinning is not expected to considerably increase resilience at the stand level. Density is expected to continue to vary across stands following treatment, as shown by tree per acre and basal area values for differing management areas under Alternative 1. Denser areas will remain at increased risk compared to Alternative 1. High density not commercially thinned areas under Alternative 4 would, on average, remain at the threshold of concern for white fir, indicating that these stands are at high levels of risk for increase mortality in all species. Compared to Alternative 1 more areas would remain above the threshold of concern for pines and oaks, indicating that these species are likely to be at increased risk of loss. Reduced stand density index in commercially thinned areas is a factor of the stands that would continue to be thinned under this alternative, rather than different prescriptions in commercially thinned stands compared to Alternative 1.

Increased mortality for larger diameter pines is not expected to be measurably different than Alternative 1, as follow-up burn treatments typically would occur sooner than trees would be able to take advantage of additional resources with both alternatives. However in stands where release of these trees would not occur under this alternative these trees would continue to have high competition for resources and would remain at a higher risk of loss.

Species Composition

Proposed treatments would reduce the proportion of incense cedar and Douglas-fir and increase the proportion of pine in terms of trees per acre and basal area; however the proportion of stands occupied by white fir would also increase, perpetuating an unsustainable and undesirable condition in upper slope and ridge top stands. Release of California black oak from overtopping conifers would not occur in stands that are not commercially thinned under this alternative and therefore oak is expected to

continue to decline in some stands, while in terms of trees per acre oak is estimated to continue to increase due to burning and other activities. The proportion of ponderosa pine and oak in stands is expected to continue to decrease as the proportion of shade tolerant white-fir, Douglas-fir, and cedar are expected to increase.

Cumulative Effects

Treatment with Alternative 4 is not expected to change the vegetation typing or size class measure over a majority of the project area. Benefits to oaks from treatment are not expected to decrease the trend of declining oak within the project area. It is expected that this project would not measurably contribute to the trend of declining large trees (greater than 30 inches dbh) within the project area, that has resulted from past harvest practices and mortality of larger trees removed in salvage operations. This project is expected to alter some snag and down log location and distribution within the project area, however, this project is not expected to contribute to a decrease in these structures that resulted mainly from past treatment practices.

Alternative 5

Direct & Indirect Effects

Heterogeneity

Compared to Alternative 1, less of the landscape would be managed as uniform non-treatment areas, with higher densities of trees, and structure would be better influenced by topographic variations under active fire regimes (Lydersen and North, 2012). Topography would continue to be used to inform variable density management and would be used to increase treatment on ridge top and upper slope areas to vary treatment intensity and emphasis on species composition.

Trees per Acre, Basal Area and Diameter

The number of trees per acre and basal area per acre would be immediately reduced through thinning and burning activities. The number of trees per acre would fluctuate over time as trees continue to establish and die within the stands. Basal area and average diameter are expected to increase as existing trees within the stand grow until mortality from wildfire or insect causes a large proportion of large trees within the stands to die. While some large trees within the stand would continue to grow, growth in stands with heavier thinning is expected to be more rapid for individual residual trees than it would be with the proposed thinning activities. Average basal area is expected to be reduced by 69 square feet or 28% with a maximum modeled reduction of 67%.

Like Alternative 1, within the average conditions projected after treatment structures are expected to differ based on topographic position and current stand structure. On most slope positions stand structure following thinning would be the same as under Alternative 1, however in ridge top stands thinning would be heavier than under Alternative 1. Alternative 5 would reduce the proportion of high density areas maintained on ridge tops, although variable density thinning would be used to maintain a

heterogeneous structure within treated stands. Ridge areas incorporate the mix of high density, low density and matrix areas that would occur within those stands.

Thinning is focused in stands with lower density and smaller trees, so 89% of removal is still expected to occur in diameter classes smaller than 20 inches. Alternative 5 slightly increases the proportion of removal in trees above 16 inches dbh and also the proportion of trees in the 4-10 inch dbh class.

Over time the proportion of trees in the smaller diameter classes are expected to decrease while trees in the upper diameter classes are expected to increase. An increase in the largest diameter class is expected to be increased from Alternative 1 while trees per acre in the medium sized classes are expected to be lower.

Canopy Cover

Canopy cover in treatment units would decrease as a result of management actions. In the long-term canopy cover is expected to gradually increase. Average canopy cover reduction from mechanical thinning is 11% with a maximum modeled reduction of 46%. High density areas would continue to maintain higher canopy cover on average while ridge top stands would have lower on average canopy covers.

Only minor decreases would be seen in the canopy cover contributed by any size class. Over time it is anticipated that canopy cover contributed by smaller trees would continue to decline due to mortality and increase in size of residual trees. This alternative results in slightly higher reductions in average canopy cover under each size class treated.

Likely some CWHR density classes would be reduced through thinning where stands are at the lower end of the canopy cover measure prior to thinning and in ridge top areas where stands would be more heavily thinned under this alternative. With Alternative 5 it is still expected that the majority of CWHR Class of stands would remain unchanged over the short-term. In the long-term it is expected that some additional stands would move into the 5 classification. The move into size class 5 is expected to be more rapid for some stands than it would have been in Alternative 1.

Understory

In areas treated the same as Alternative 1 it is expected that effects would be the same as described. In areas where treatment intensity is increased the area of stands occupied by understory grasses and forbs would likely increase. It is also likely that on ridge top areas where thinning is more intense that brush would respond to enhanced light conditions and additional areas are likely to be dominated by shrubs, which could decrease the growth of grasses and forbs in these areas.

Defect trees, Snags, and Down logs

Reduction in trees providing microhabitat is expected to be slightly greater than with Alternative 1 due to additional removal in 16-30 inch dbh trees. However, as the majority of these trees would still be

retained due to the fact that many of these trees are greater than 30 inches dbh and through specific protection of these trees. Some incidental reduction in the number of existing snags from hazard tree falling and to snags and down logs as part of the prescribed fire, machine piling and pile burning activities are expected similar to Alternative 1. Snag numbers are expected to be similar to, although slightly lower than Alternative 1; however based on modeling predictions snag numbers would continue to exceed Forest Plan Standards.

Growth and Competition

By removing some of the smaller trees, growth would be concentrated on larger trees and mortality would be reduced, however net basal area growth would be reduced from Alternative 1 for ponderosa pine and for all species combined. Sugar pine is shown to experience slightly higher basal area growth and less mortality than with Alternative 1. Net basal area growth over the modeled period with Alternative 5 is 34.5 square feet of basal area per acre for all species, which is less than Alternative 1. While individual trees are expected to experience increased growth, some areas of more intense thinning are potentially being thinned below stocking levels where residual trees may not be able to rapidly capture potential growth. Basal area mortality for sugar pine, ponderosa pine and for all species would be lowest with this alternative.

Stand density as measured by Stand Density Index within the proposed treatment areas would be reduced, reducing the competition between trees thereby improving residual tree health. Alternative 5 is expected to reduce the average density, as measured by Stand Density Index (SDI) to 251, approximately 44% of the maximum density for pine. With implementation of follow-up burn activities, these stands are expected to remain below the threshold of concern for the long-term. This alternative best provides for maintenance of pine and oak in treated stands.

Density is expected to continue to vary across stands following treatment, as shown by tree per acre and basal area values for differing management areas. Compared to Alternative 1 less areas would remain above the threshold of concern for pines and oaks, indicating that these species are likely to be at reduced risk of loss. Reduced stand density index in commercially thinned areas under this alternative is a factor of increased thinning intensity.

Increased mortality for larger diameter pines after prescribed burning is not expected to be measurably different than with Alternative 1, as burn treatments typically would occur sooner than trees would be able to take advantage of additional resources. However release of these trees would occur at a higher rate in some treated stands and therefore these trees would have a reduced risk of loss under this alternative.

Species Competition

Proposed treatments would reduce the proportion of trees per acre and basal area for incense cedar, Douglas-fir, and white fir and increase the proportion of pine and oak. Release of oaks from overtopping conifers would help promote this species. Burning and other activities are estimated to

increase the number of oak trees per acre more than with Alternative 1. The proportion of basal area occupied by oak is also expected to increase over the short term. The proportion of ponderosa pine and oak in stands is expected be maintained through the modeled period, although white fir does begin to increase in dominance as time from treatment increases.

Cumulative Effects

Treatment with Alternative 5 is not expected to change the vegetation typing or size class measure over a majority of the project area although some areas currently classified as mixed conifer on ridge tops may be reclassified as pine. Benefits to oaks from treatment would result in reductions in the trend of declining oak within the project area, and will sustain oak in treated areas longer than with no treatment. It is expected that this project would not measurably contribute to the trend of declining large trees (greater than 30 inches dbh) within the project area, that has resulted from past harvest practices and mortality of larger trees removed in salvage operations. This project is expected to alter some snag and down log location and distribution within the project area, however, this project is not expected to contribute to a decrease in these structures that resulted mainly from past treatment practices.

Fire/Fuels

The effects to fire behavior are summarized from the Fuels and Fire Analysis Blacksmith Project (Ebert 2013a). This analysis reviews fire's role within the project area, fire history and describes the current fire hazard and risk of ignition within the project area. The methodology of the analysis provides information on the type of fire modeling and specific measurements used to assess the effects of each alternative. A combination of professional fire management assessment and fire modeling is used to provide a meaningful analysis of potential effects of fire behavior related to the spread, intensity, fire type and strategies of fire managers to contain a wildland fire within the Blacksmith Project Area.

Affected Environment

Fire Hazard & Risk

Fire risk is the chance (probability) that a wildfire will start, either from natural or human based on recent fire history. Fire hazard is determined by the characteristics of fuels the influences of topography and weather. The fuels characteristics apply to both dead and and include loading (tonnage), size and shape, compactness, horizontal continuity, vertical arrangement, fuel moisture content, and chemical properties. Topographic and weather combined with fuels characteristics, determine the rate of forward spread of a fire and the which a fire will burn. The Blacksmith proposed treatment units are classified as follows in

Table 7

Table 7 Fire Hazard and Risk by 7th Field Watershed

Watershed Name	Hazard	Risk
Big Grizzly Canyon	Extreme	High
Lower Long Canyon	Extreme	High
Lower Rubicon River	Extreme	High
Middle Fork American River-Big Mosquito Creek	Extreme	Moderate
Middle Fork American River-Brushy Canyon	Extreme	Moderate
Middle Fork American River-Chipmunk Creek	Low	Moderate
Middle Long Canyon	Very High	High
North Fork Long Canyon Creek	Very High	High
Rubicon River-Leonardi Spring	Extreme	High
Rubicon River-Pigeon Roost Canyon	Extreme	High
Rubicon River-Stony Creek	Extreme	High
South Fork Long Canyon Creek	Extreme	High
Wallace Canyon	Extreme	High

Fuels

Within the project area, vegetation type varies, creating a mosaic pattern on the landscape. With the absence of fire due to fire suppression and other management activities an accumulation of dead fuels, shrub and small tree understory connect the surface to the overstory fuels. Table 8 displays the amount and type of fuels within the planning area; figure 2 visually displays their position on the landscape.

Table 8 Vegetation Categories for Fuel Modeling within the Blacksmith Planning Area

Vegetation Category	Acres	Primary Carrier of Fire
Non-Burnable	491	Barren Land, Rock, and Water
Grass	272	Grass
Grass/Shrub	1,126	Grass with small shrub influence
Low/Moderate Shrub Load	2,397	Shrubs less than 4 foot tall
High/Very High Shrub Load	2,409	Shrubs greater than 4 foot tall
Low Load Timber Shrub	2,967	Bear Clover, small shrubs less than 2 feet
High Load Timber Shrub	16,867	Bear Clover with ladder fuels such as small trees and shrubs
Low/Moderate Conifer/Hardwood	1,775	Needle Cast and small dead and downed fuels typically 10 hour fuels
High/Very High Conifer/Hardwood Load	16,245	Needle Cast with heavy component of dead and down fuels
Activity Slash/Blowdown	2,199	Areas with natural blowdown and heavy fuel loadings

Fire Behavior Synopsis

The project area presents a situation where fire starts are difficult to access due to topographic features and lack of roads and trails. Aircraft such as air tankers and helicopters are used to keep fires small

and allow ground forces the time to get to the location. Emphasis is on containing initial fire starts, as containing large fires in the area is difficult due to the topography.

Approximately 75% of the planning area has fuel conditions exhibiting high fuel loadings which are capable of producing surface flame lengths greater than 5 feet and approximately 52% of the planning area could have flame lengths in excess of 11 feet under 90th percentile weather conditions. There are enough ladder fuels in the mid-story canopy connecting to the overstory dominant and co-dominant trees to initiate crown fire activity. The current fuel conditions in combination with topographic features create the potential for high severity effects on 80% of the 51,594 acre planning area exists under 90th percentile weather conditions. The amount, type, size and arrangement of fuels result in fire intensities greater than 500 btu/ft/sec on 51% of the planning area. These are areas where crown fire and spot fires become a concern in the control of a wildland fire. Across the landscape, 70% of the planning area has the potential to exhibit crown fire activity, both passive (40%) and active (30%) combined. While 40% of the landscape is modeled to have the potential to exhibit passive crown fire activity, if a large fire were to develop in the planning area, it would be expected that these areas also would have the potential to exhibit more active crown fire than shown through modeling. This is because FlamMap analyzes potential fire behavior that does not account for the convective energy of a large fire along with increased winds and preheating of fuels.

Both Flame Length and Fireline Intensity are factors in determining crown fire initiation into the canopy and crown fire type given fuel and weather conditions. At 90th percentile conditions, all fuels with a canopy overstory would present some type of crown fire activity dependent on canopy base heights. Low canopy base heights require less direct flame lengths and heating to torch and reach canopies due to their connectivity to the surface fuels below.

Private land is intermixed within the project area. The majority of these lands are utilized for timber production and activities such as pre-commercial thinning, clear-cut, thinning from above or overstory removal of dominant and co-dominate trees, decrease fire resistance (Stephens et al 2012, Stephens and Moghaddas 2005). Some activities are beneficial from a fire behavior perspective, as clear cuts for example can reduce fire spread and intensity and serve as safety zones for fireline personnel, if large enough. However, pre-commercial thinning and tree planting increase the fuels problems as pre-commercial thinning leaves cut trees onsite increasing fuel loadings and fuel height. As plantations grow, trees increase in height and canopies become interconnected with both the ground and adjoining trees onsite. Therefore at times private land may enhance fire behavior and at other times adjacent private lands may contribute to moderating fire behavior. Despite the distance from wildland urban intermix, in this area there is very little opportunity to manage fire to achieve ecological objectives in the future due to the mixed ownership which increases risk and liability for managed fire, air quality requirements, and ability to assure achievement of resource objectives with the given terrain and fuel loadings.

Environmental Consequences

Alternative 2

Direct & Indirect Effects

Under Alternative 2, there would be no direct or indirect effects since no project related activities would occur; fuels would continue to remain at their current levels and are expected to increase as surface fuels continue to accumulate. Small diameter trees and shrubs would continue to grow in the understory and increasing both the horizontal and vertical arrangement of fuels. These ladder fuels would continue to extend into the overstory. Natural decomposition of fuels would continue to occur but not at a rate to outpace new accumulations of dead fuels.

Potential would continue to exist for high severity fire to occur over much of the planning area. Since current fuel loadings are high, increased residence time of heat in the soil would be expected along with increased heat transfer from surrounding fuels burning at the surface and ground level. This would potentially affect large trees where heavy accumulations of duff material remain from the absence of fire and long-term smoldering can cause extended high soil heating, frequently above 140 °F, which is the temperature required to kill tissue (Hood 2010). Ground fires and consumption of large-diameter surface fuels can cause root and basal stem injury by consuming fine roots growing in the duff layer and through long-term heating of the soil and cambium at the tree base (Hood 2010; Hungerford and others 1994; Ryan and Frandsen 1991).

In addition to ground fuels contributing to large tree mortality from excessive heating of the cambium and roots, where current fuel loading and fuel structure are such that crown fire propagation is probable; injury to the tree crowns also affects potential mortality and susceptibility to disease due to the trees weakened state. Utilizing the Behave Plus Fire Modeling Program, tree mortality predicted by species under 90^{th} percentile weather conditions shows that as tree size and dbh decrease, mortality increases for all surface fuel conditions. For large pines, an estimated 87% of ponderosa pine are expected to die in 33 percent of the planning area that consists of high load timber understory shrub and up to 73 percent in the 33 percent of the planning area composed of high/very high fuel loads in mixed conifer/hardwood. Similar mortality rates would be expected with Sugar Pine and White Fir trees in the planning area.

Plantations within the Blacksmith planning area are an additional concern for fuels. These areas consist of pine trees spaced closely together with interconnected crowns. Manzanita brush, needle drape, and grass are the predominate make up of surface fuels. A fire in these stands would be difficult to control and expect mortality of plantation stands high due to the relative small tree size and interconnectivity to the surface fuels.

Cumulative Effects

No cumulative effects would occur under Alternative 2. Current potential fire behavior within the planning area would continue to exist. While Big Grizzly affords some opportunities to reduce risk to California and Northern Goshawk PACs from high severity wildfire, other areas remain in a condition subject to high severity fire effects and high potential for fire to travel uniformly across the landscape and into and out of Spotted Owl PACs. Landscape fire modeling of fire spread shows expected fire growth for select, random ignition points.

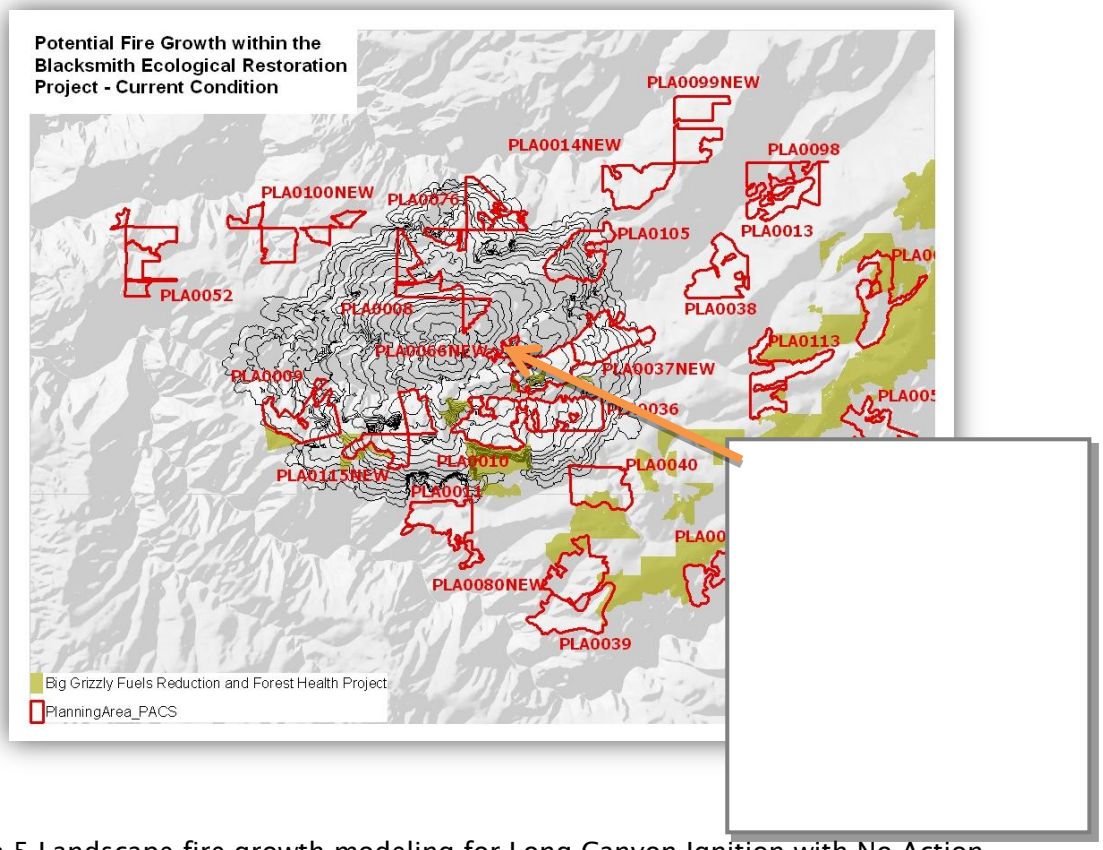

Figure 5 Landscape fire growth modeling for Long Canyon Ignition with No Action

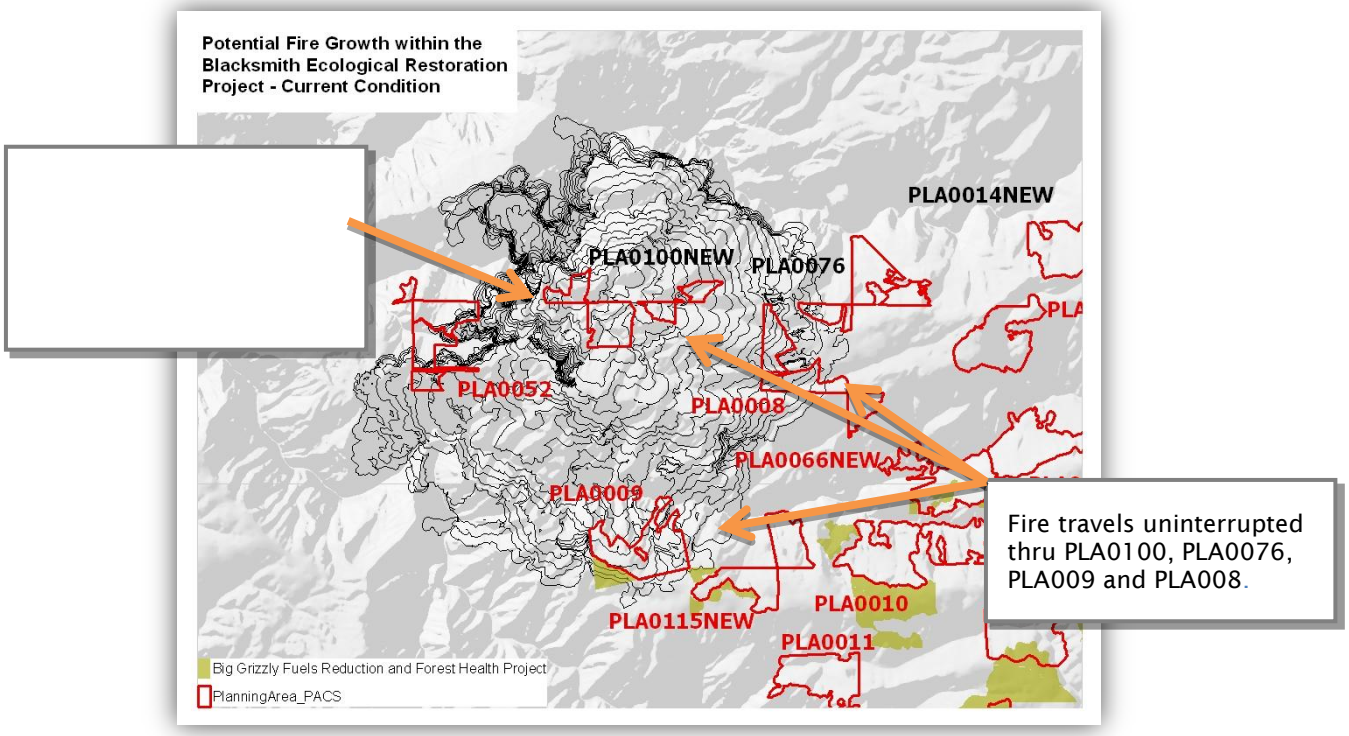

Figure 6 Landscape fire growth modeling for Pigeon Roost Ignition with No Action

Alternative 1

Direct & Indirect Effects

Proposed thinning with follow up pile burning and prescribed fire activities would reduce surface fuels, remove small diameter trees reducing ladder fuels, increase canopy base heights, and reduce crown bulk density of overstory dominant and co-dominant trees within units proposed for commercial thinning. The change in surface and overstory fuels correlates to a reduction in fire behavior within the treatment units. A change in surface fuels affects flame length, rate of spread, fireline intensity and crown fire activity. A change in surface fuels inconjunction with removal of the ladder fuels and some overstory trees would reduce crown fire activity and type.

Mastication would shift live to dead fuel ratio, increase canopy base heights, and break-up horizontal fuel continuity and the vertical arrangement. While mastication can raise the canopy base height and reduce canopy bulk density, lessening the likelihood of crown fire, increased surface fuel loads resulting from these treatments have the potential to yield more intense surface fire behavior (Stephens 1998, Vaillant et al. 2010). Post treatment conditions within masticated areas could potentially cause increased fireline intensities in the short-term; however, as decomposition of the masticated material occurs, fireline intensities would be reduced overtime. Prolonged heat duration is also of concern within masticated material. As the masticated material is generally within the 100 hour fuel class, this in combination with fuel compaction, potentially results in increased mortality of the residual trees.

The age and density of brush within the units designated for mastication would determine the potential increase in fireline intensities. As brush densities increase, fireline intensities would increase. However, reduction of rates of spread, flame lengths, and crown fire potential would occur due to the change in fuel continuity and arrangement. While mastication alone can reduce the likelihood of crown fire, mastication followed by prescribed burning not only reduces crown fire potential, it also reduces flame lengths and rates of spread due to the reduction of surface fuel loadings. Utilizing herbicides in select masticated areas provides for a longer lasting fuels treatment.

Direct effects of prescribed fire are the consumption and subsequent reduction in ground and surface fuels. Typically 70% of dead surface fuel is consumed within the 1 and 10 hour dead fuel category (0-1 inch fuels). Dependent on seasonality, 100 and 1000 hour fuels (> than 1" fuels) can be partially and/or fully consumed. Ground fuels are reduced as portions of the duff layer are consumed. Prescribed fire activities would naturally prune the lower branches of trees effectively increasing the canopy base heights. Canopy bulk density would not be expected to change as mid-story and overstory canopies would remain intact. Isolated torching of single trees is expected where enough surface fuels exist to perpetuate activity even at cooler weather conditions when prescribed burning is planned.

Units proposed for prescribed fire only may take up to three entries to achieve desired fuel objectives. Initial treatments would reduce surface fuel loads; however, overtime dead fuels would increase as dead material from the initial burn fall to the ground and accumulate. By the third entry, it is expected that the area would have sufficiently increased canopy base heights to the point that additional dead overstory fuels resulting from prescribed fire activities would be minimal.

Mechanical treatments are important because there is a high probability these treatments will be accomplished. The units proposed for thinning have the ability to be implemented and meet Alternative 1 in a timely manner without the many restrictions of prescribed burning. Prescribed fire can be difficult to implement for numerous reasons. California has some of the most restrictive air quality regulations in the country, a relatively high density of rural homes surrounded by flammable vegetation, extremely dry conditions during periods when prescribed fire could be used, and rugged topography that challenges containment efforts. Within Alternative 1, prescribed burn units are intermixed between mechanical treatments to expand the effectiveness of the mechanical thinning units. Additionally there are stand-alone units located in the Rubicon River Drainage; this prescribed burn area will take advantage of the Big Grizzly Fuels Reduction Project to apply prescribed fire to steep slopes utilizing the mechanical treatments along the rim of the Rubicon River.

The benefit in the end is mechanical treatments meet the fuels objective of reducing problem and extreme fire behavior with the added benefit of expanding some windows for implementing prescribed burning. With the change in fuel conditions the resources required to implement and hold the prescribed burn would be less as well due to the decreased risk associated with burning in open stands with decreased fuel loadings. Air quality issues would lessen with the amount of because fuel

accumulations are reduced, which leads to less smoke emissions. Finer fuels produce less smoke emission with shorter duration compared to larger fuels which would be expected to produce emissions for a longer duration as these fuels continue to consume.

The longevity of fuel treatments varies by vegetation type. However, field observations from previous projects on the Georgetown Ranger District indicate that mechanical fuels treatments in-conjunction with prescribed fire last at a minimum 10 years or greater. Incorporating the use of prescribed fire as a maintenance tool can increase their longevity an additional 10 years. Stephens and others (2012) highlight the effectiveness of fuels treatments and potential longevity. They found in their study that prescribed fire only treatments begin to diminish in effectiveness at 10 years. Follow-up burning can increase their effectiveness to 15 to 20 years.

Flame lengths less than 4 feet would be anticipated post treatment in 95% of the treatments. Areas where flame lengths are still greater than 8 feet would predominately be in prescribed fire only units it is anticipated that not all areas would burn or reduce fuels due to the mosaic pattern of burning. Alternative 1 would reduce rate of spread to less than 5 chains per hour on 6,462 acres (95% of the treated area) immediately post treatment. A 20% reduction in rate of spread would occur across the treatment units. Reduced rates of spread give fire managers opportunities to plan a containment strategy. Fire type would be reduced from crown fire for 82% of the treatment area. After treatment more than 96% of the treatment area would be expected to burn as a surface fire under 90^{th} percentile conditions. In the advent of a large fire, it would be expected that as fire enters the treated area, the fire front would slow, reducing the intensity as it moves through the treated stands. Furthermore, mortality of large diameter trees would be expected to be reduced to a 3% probability.

Cumulative Effects

Alternative 1 treats 1,673 acres of SPLATS within the Blacksmith Planning Area. When combined with the Big Grizzly Project (currently being implemented) 71% of SPLATs within the planning area will be treated. The overall cumulative result is that fire spread and size is reduced and intensity of the fire is changed adjacent to the treatment units as fire slowly moves through the treated units and flanks around them. Treating fuels within and adjacent to Protected Activity Centers (PACS) for the California Spotted Owl and Northern Goshawk would assist in reducing negative fire effects inside PACS where treatments may not occur. The more fuels that can be treated adjacent to and within these areas, the greater the fire behavior is decreased and large tree survival would be expected as a flanking fire around the treated units would lessen fire effects on those areas immediately adjacent to such units.

From a fire suppression standpoint, the majority of thinning treatments are located on strategic ridge lines that would be used to contain a large fire in the planning area. Having these treatment areas in place allow fire managers to concentrate forces on other sections of a fire where line construction is

needed. Fire resources can make a stand in these units either by picking the fire up direct in the treatment units or utilizing them as a place to burnout from. Suppression damage would typically be less than the current condition since post treatment fuel conditions would be such that either handline construction or a single blade dozer line could be utilized. During the Ralston fire (2006), a minimum six blade dozer line was utilized to control the fire (Sandoval per com, 2013). A D-8 Dozer blade is approximately 10 feet wide. Suppression damage to these areas includes approximately 40 to 60 feet of line that is constructed to mineral soil; trees shrubs and other vegetation are removed and pushed into large berms.

While Alternative 1 decreases fire behavior potential inside and immediately adjacent to proposed treatment units, the Blacksmith Planning Area still contains, and will contain, areas post treatment that exhibit potential for high severity fire. The current potential crown fire activity in the Blacksmith Planning Area is 70%. Alternative 1 reduces that potential by 10%. This results in approximately 60% of the planning area which still has an opportunity to experience crown fire activity and high severity fire effects.

Mechanical treatments planned adjacent to PACs have the benefit of being completed without the restrictions placed on prescribed burning. These treatments provide areas for a large fire to be slowed causing fire to flank around these treatment units disrupting the uniformity of fire spread as compared to Alternative 2.

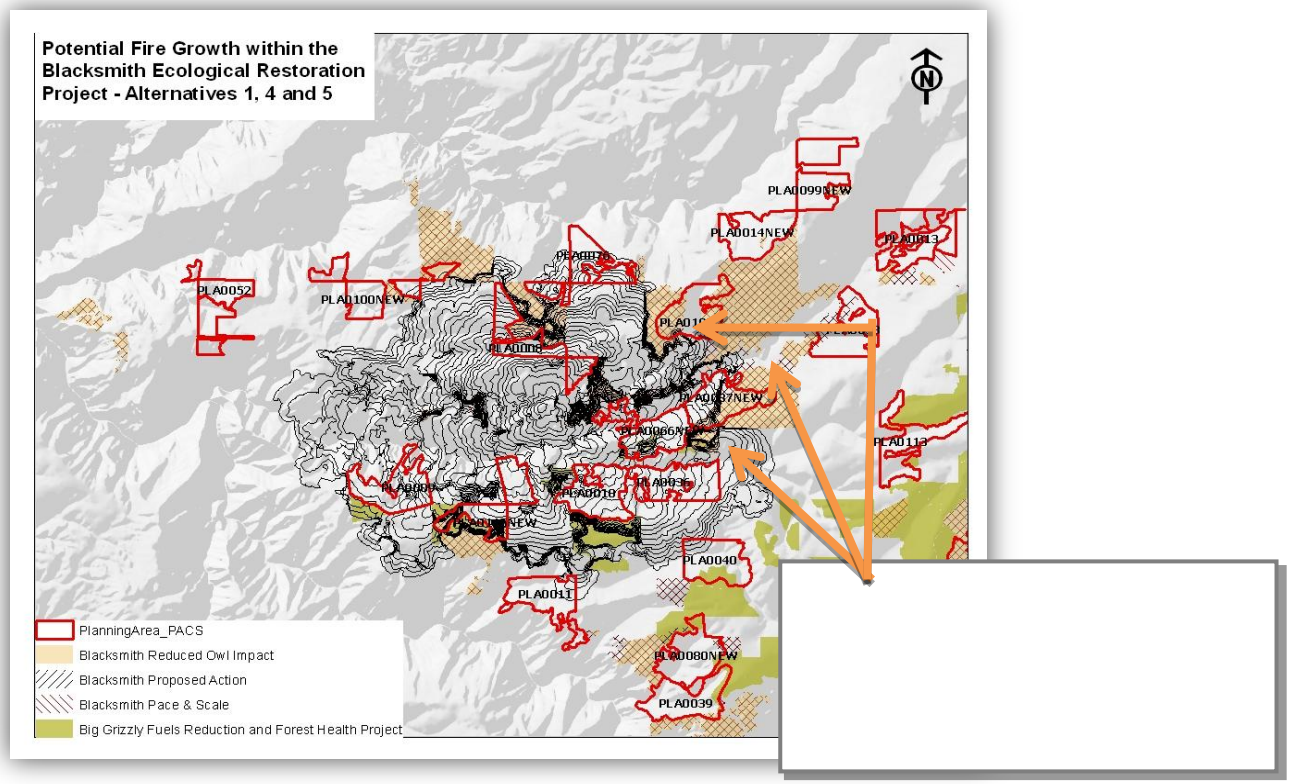

Figure 7 Landscape fire growth for Long Canyon ignition with action alternatives.

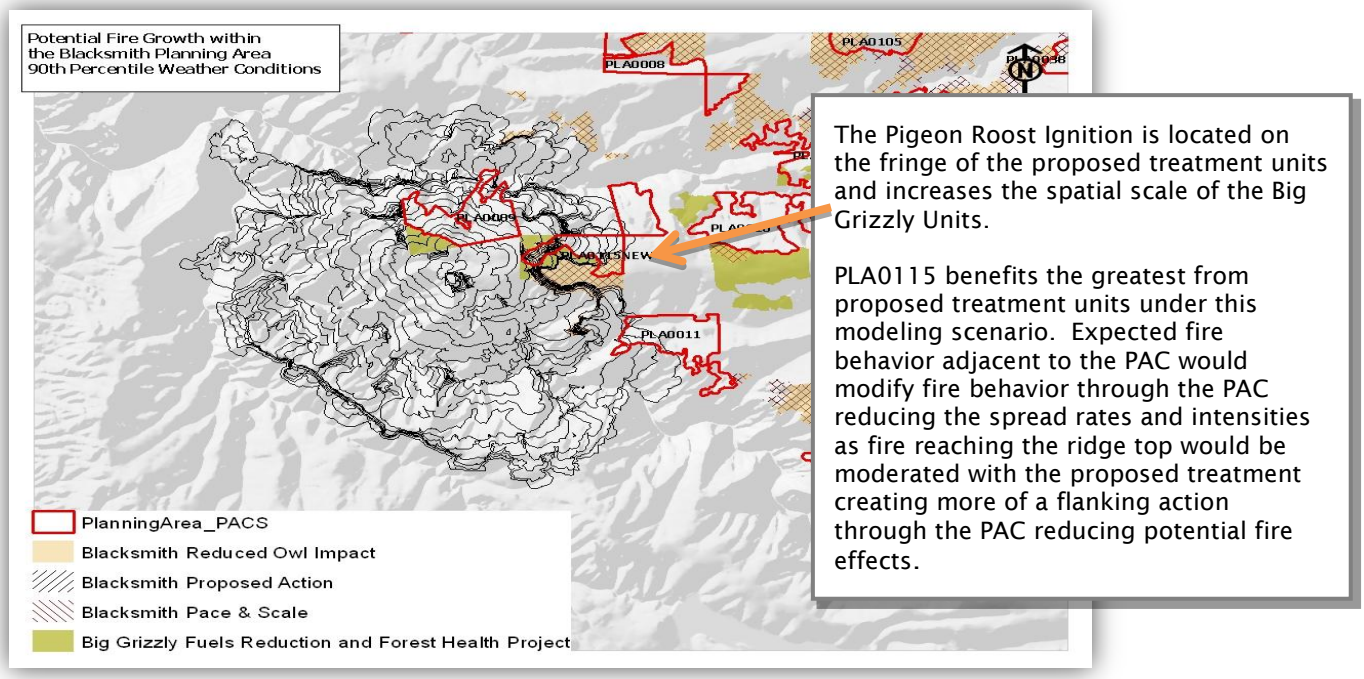

Figure 8 Landscape fire growth modeling with Pigeon Roost ignition for action alternatives.

Alternative 3

Direct & Indirect Effects

Compared to Alternative 1 3,942 fewer acres of treatments would occur. Within the units proposed for treatment under this alternative, the treatment would produce similar effects as Alternative 1 in terms of reducing fireline intensities, flame length, rates of spread and crown fire potential. Localized negative effects potentially could occur in those areas proposed for treatment eliminated from treatment or not completed due to funding.

Prescribed fire occurring within the treatment units proposed for mechanical thinning may see a minor increase in tree mortality immediately adjacent to piles that would otherwise be in open areas under Alternative 1. Piles may scorch the lower limbs of residual trees or isolated single tree torching may result where piles are located near or under the canopy of the smaller trees left onsite. This increase in mortality would also be due to the additional number of piles created onsite since all material cut would be piled and not removed from the project area.

Cumulative Effects

At the landscape level, Alternative 3 is less effective at modifying fire growth within the Blacksmith Planning Area. Due to the elimination of prescribed fire treatments and overall size of the project, fire is able to move through the landscape with faster rates of spread when compared to Alternatives 1. Additionally, the reduction in the size and shape of the project would increase the potential for a large fire to potentially spot over the treated areas starting a fire on the other side of the treatment unit. When combined with the Big Grizzly Fuels Reduction Project, 62% of SPLATS within the Blacksmith Planning Area would be treated under Alternative 3.

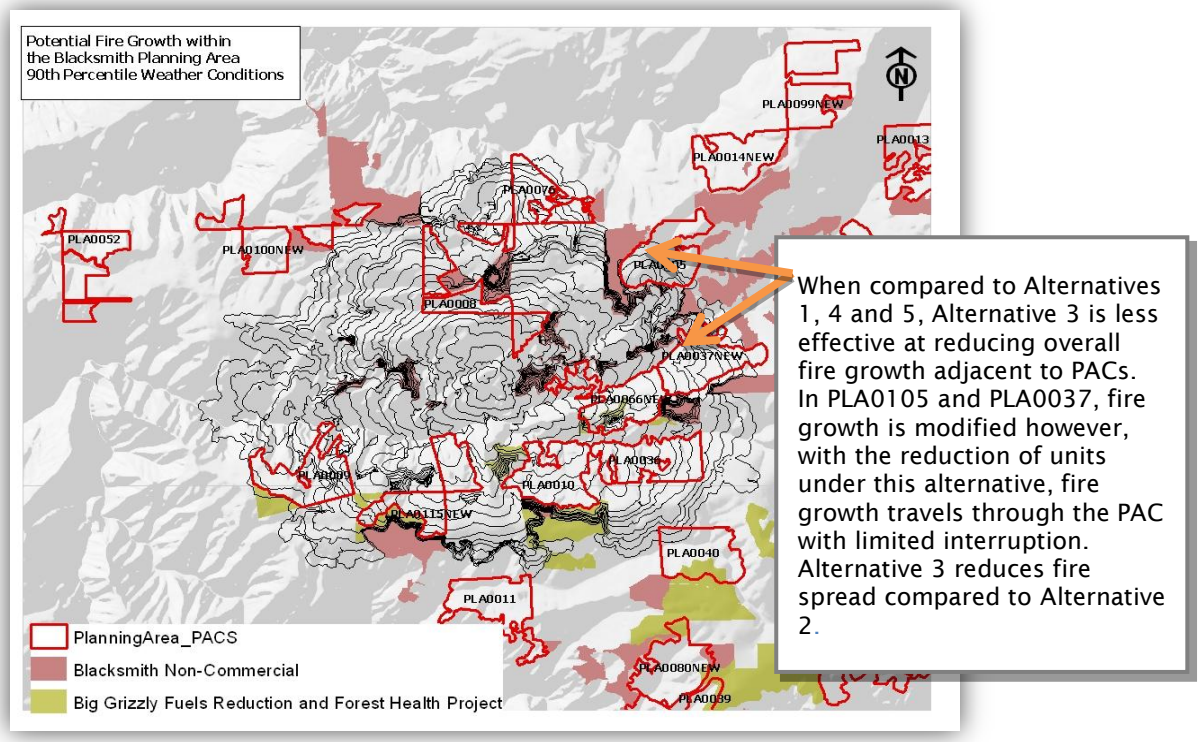

Figure 9 Landscape fire modeling for Long Canyon Ignition with Alternative 3

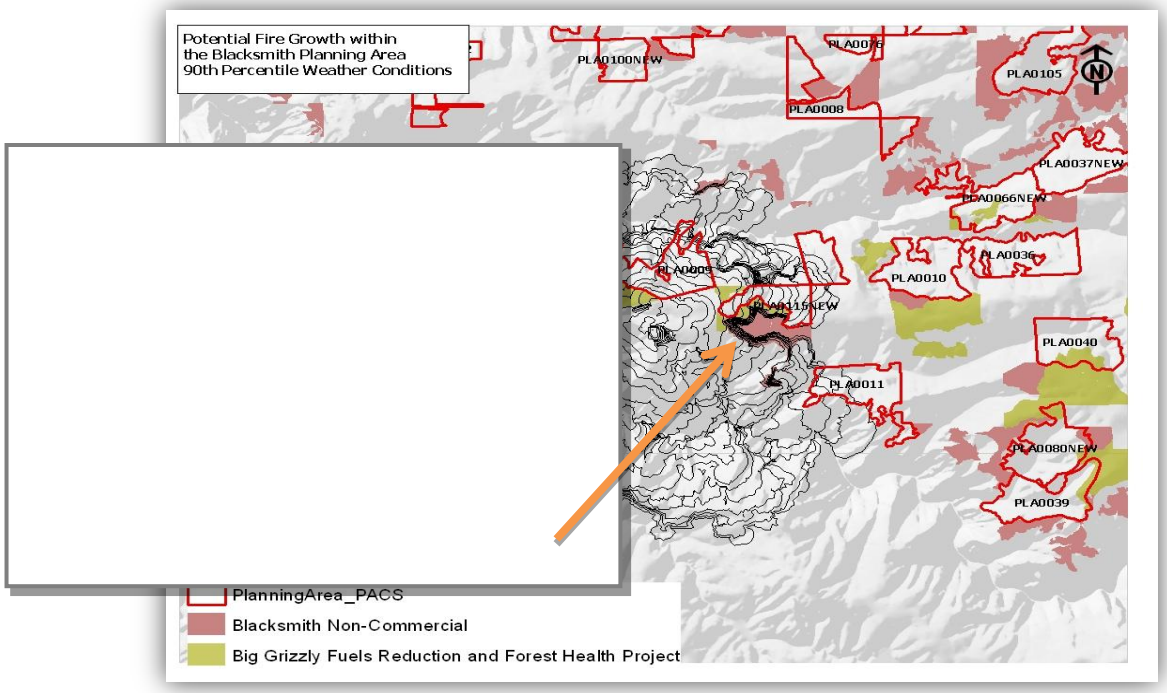

Figure 10 Landscape fire growth modeling for Pigeon Roost ignition with Alternative 3

Climate Change

Alternative 3 is expected to be less effective when compared to Alternatives 1, 4 and 5 at responding to potential impacts of climate change, including increased temperatures and longer duration fire season.

Alternative 4

Direct & Indirect Effects

Within the units proposed for treatment, effects to fuel conditions would be similar as discussed above under Alternative 1 in terms of reducing fireline intensities, flame length, rates of spread and crown fire potential.

Cumulative Effects

At the landscape level, Alternative 4 is comparable to Alternative 1. While approximately 595 fewer acres of fewer treatments occur, the location of reduced acreage is in proximity to large areas where mechanical and prescribed fire activities are still planned. Therefore, at the landscape level, Alternative 4 would be an efficient project to reduce the spread and intensity of a wildfire within the planning area.

With Alternative 4 treatment would occur within 1,339 acres identified as SPLATS. When combined with the Big Grizzly Fuels Project, 66% of SPLATS within the Blacksmith Planning Area would be treated under Alternative 4.

Alternative 5

Direct & Indirect Effects

Similar effects to fuels would occur under Alternative 5 as discussed above in Alternative 1. The main difference would be in the overstory canopy; the additional intensive thinning on identified ridge tops would further meet the fuels objective by reducing crown bulk density within these areas which decrease the potential for an active crown fire to occur. The additional treatment on 100 acres would decrease fire behavior within treated stands to result in a surface fire, with flame lengths less than 4 feet and fireline intensities less than 100 btu/ft/sec.

Cumulative Effects

Results similar to that of Alternative 1 would be expected. The location of the additional acres and the ignition points used for comparison produce the same results as Alternative 1 since the additional acreage is located in area adjacent to proposed treatment in which a simulated fire did not reach during the fire simulation. The additional 100 acres of treatment further enhance the units under Alternative 1 since they adjoin those units increasing their size and effectiveness. Treatments would occur within 1,711 acres of Identified SPLATS.

Botany

Effects to Threatened and Endangered, Sensitive, Special Interest Species and Watchlist plants, and risk for invasive plants are summarized from T. Walsh (2013). Three Sensitive plant species Stebbin's Phacelia (Phacelia stebbinsii), Sawthooth lewisia (Lewisia serrata), and the Sierra bluegrass (Poa sierrae) have been documented in the proposed Blacksmith Ecological Restoration Project. No other occurrences of Sensitive plant species were located during surveys although potential habitat is present for Eldorado National Forest. The project area was surveyed for Sensitive plants and noxious weeds primarily in 2012. Surveys targeted potential habitat (lava cap, meadows, riparian areas, north facing slopes, etc.) throughout the project area. All sensitive plant habitats and the majority of the Poa sierrae occurrences in the project area were also monitored in 2013.

Affected Environment

Three Sensitive plant species Stebbin's Phacelia (Phacelia stebbinsii), Sawthooth lewisia (Lewisia serrata), and the Sierra bluegrass (Poa sierrae) have been documented in the proposed Blacksmith Ecological Restoration Project. No other occurrences of Sensitive plant species were located during surveys although potential habitat is present for Eldorado National Forest (ENF) for Allium tribracteatum, Botrychium spps., Cypripedium montanum, Lewisia kelloggii ssp. kelloggii and ssp. hutchisonii, Meesia triquetra, Meesia uliginosa, Calochortus clavatus var. avius, Peltigera hydothyria, Arctostaphylos nissenana, and Parry's horkelia.

Four watchlist plant species, Redhills soaproot, Rein orchid Pacific yew and California Torreya were identified within units. Chlorogalum grandiflorum (Red Hills soaproot), is overlapped by noxious weed occurrences of starthistle.

Three high priority noxious weed species, Scotch broom, yellow starthistle and rush skeletonweed, were identified within the project area. The occurrences of greatest concern are located at or near units 321002, 322006,325001, 325003, 325007.

Sawthooth lewisia (Lewisia serrata)

Sawthooth lewisia is endemic to the American River watershed, ranging from several scattered location on the Tahoe NF between the North and Middle Forks of the American River, to five locations on the ENF between the South and Middle Forks of the American River. The largest occurrence on the ENF is the Long Canyon occurrence, where flooding in 1997 reported scouring in this steep rocky canyon, is reported to have more than 5,000 plants, as well as unsurveyed habitat.

Habitat for this perennial herb is provided by steep, metasedimentary bedrock outcrops with northerly aspects at elevations of 2,850 to 4,700 feet in elevation. Plants are typically found in the inner gorges of perennial streams, although a few occurrences are found near seeps and intermittent streams. Relatively high humidity is often listed as a key habitat attribute, due to the frequent presence of the

species in the "mist zone" of waterfalls. The lewisia is threatened by potential horticultural collecting and small hydroelectric power projects. Habitat is easily damaged by foot traffic making it difficult to monitor (steep mossy, rock faces) without impacts to habitat and possibly to human safety. The moss-covered rock-faces that provide habitat for this species are very fragile.

Sierra Bluegrass (Poa sierrae)

Poa sierrae is a new species to the ENF, discovered during project surveys for the proposed Blacksmith Ecological Restoration Project in the spring of 2012. It was proposed for addition to the Region 5 Sensitive Vascular Plant list in July, 2012. Survey crews found occurrences growing in patches from approximately one square foot to over 100 square feet. Two populations were found in dispersed camping sites and along a well-used trail. In the proposed Blacksmith project, most occurrences were found in remote habitat in the Ramsey area, on steep, shady, moist rocky north facing slopes of the canyon.

Sierra Bluegrass tends to grow on the generally steep slopes of canyons or tributaries to deep canyons, most often on north facing slopes, in the more or less moist, shady to partly shady understory of conifer and conifer/oak forests. Generally it grows where there is little competition from understory plants, or even mid-story trees such as Cornus. It often grows on or near mossy rocks and/or in heavy duff. It has been found on the south sides of canyons but along drainages where the microtopography is at least somewhat north facing. Occasionally it is found in openings and chaparral on north facing slopes. It grows at elevations from 1148 feet to 4921 feet. It can be found in extensive populations, but even in these it is not continuously covering the forest floor.

There are twelve documented occurrences of Sierra Bluegrass in the Blacksmith project area. Four of these, including one extensive occurrence, are in Long Canyon, three near Ramsey Crossing, and one west of there. Four are on drainages leading into the Middle Fork American River. Five of the occurrences are above the Rubicon River. All of these occurrences represent 100% of the known populations on the Eldorado NF.

The newly discovered occurrences were revisited in June of 2012 and some occurrences indicated that the plants were past flowering/fruiting, and another monitoring visit indicated loss of inflorescence parts and dying back. With this information, we can estimate that the dormancy period most likely begins in August, or late summer, when the plants are hard to see amongst other vegetation. It also appears to have very low fruit set, possibly due to poor pollination.

Stebbin's Phacelia (Phacelia stebbinsii)

This annual herb is found only in the American River Watershed between the North and South Forks of the American River, on the ENF and Tahoe National Forest (TNF), at elevations between 2,000 and 7,875 feet (CNDDB, 2013). There are 40 occurrences on the Georgetown and Pacific Ranger Districts

of the ENF. Within the Blacksmith project area, there are nine occurrences. Additional locations are likely to be discovered based on the presence of many acres of suitable habitat in the inner gorges of the American River and its tributaries.

Habitat for Stebbin's phacelia consists of dry, open, rocky areas on moderate to steep slopes, usually in association with bedrock outcrops, on ledges and slopes with rubble or talus. This plant is found at elevations between 2,000 and 6,800 feet, in areas that on average receive 57 to 63 inches of precipitation a year. The distribution of Stebbin's phacelia is not strongly correlated with aspect, though southerly aspects are more commonly observed than northerly aspects. This species is found on a wide variety of soil types, with the majority of Eldorado National Forest occurrences found on soils derived from metasedimentary rocks.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

There would be no potential for direct effects to Sensitive plant species from project activities.

In the event of wildfire, fire suppression activities likely would contribute to and increase the spread of invasive plant species. Invasive plant species where their seeds are present in the seed bank could benefit from exposed mineral soil from wildfire, and seeds of species such as Scotch broom and yellow starthistle would be stimulated to germinate. Fire line construction and other fire suppression activities would spread existing invasive species. New invasive plant species potentially would be introduced by fire suppression equipment. Post-fire road reconstruction and maintenance activities would spread existing and newly introduced invasive plant species. Effects to Sensitive plants and their habitat from wildfire would depend on the intensity and severity of wildfire. These effects would be dependent on a variety of factors such as effects to soil, destruction of plants and propagules, stimulation of germination, and removal of competing vegetation.

Cumulative Effects

Cumulative effects would not occur under this alternative.

Alternatives 1 and 5

Direct and Indirect Effects

Negative, effects of the proposed project are not expected since design criteria have been included to prevent direct and indirect effects to known Sensitive plant species. Three Sensitive plant species (Saw-toothed lewisia, Stebbins' phacelia, and Sierra bluegrass) are known to occur within the project area. There are 2 occurrences of the Sawthooth lewisia in the Blacksmith project, and will not be impacted by proposed prescribed burns located above the plant occurrence locations. These occurrences are within 600 feet of the unit boundary in areas that are not easily accessible.

Adverse impacts to sensitive terrestrial plants could occur if mechanical equipment damages or uproots sensitive plants, compact soils, or alter overstory condition. The potential for these impacts is minimal however. Within proposed units, there are 10 occurrences of Sierra Bluegrass. The 2 occurrences of Poa sierrae, POS16_009-01 and POS16_010-02 located in the Ralston Ridge area of the project have the largest concentration of plant density most likely to have direct and indirect impacts as a result of the proximity of occurrences to proposed activities within the units. Sub occurrence 1 covers approximately 11.2000 square feet of individual plants. Sub occurrence 2 covers approximately 9000 square feet in very extensive stands.

The risk associated with thinning activities impacting the Sierra bluegrass (Poa sierrae) are ground disturbance and opening up canopy overstory which has the potential to increase light to the habitat. Poa sierrae is likely moderately tolerant of mechanical thinning, due to dormancy and germination requirements. Potential ground disturbance, such as tractor thinning and raking, could possibly result in fragmentation and disturbance of the dormant vegetation causing reduction in the colony (Taylor, email correspondence). Project design criteria is expected to be sufficient in protection of the known occurrences in the area of Ralston Ridge and should be adequate to protect the ground within the populations.

There are 6 occurrences of Stebbin's phacelia in the Blacksmith project area located within units. The occurrence of Phacelia stebbinsii (PHST6_009-01) is estimated at 726 plants, designated into 5 sub-populations coving 0.11 acres.

Within the proposed alternative, approximately 3,758 acres of prescribed burning will be conducted. In general the actual prescribed fire has limited impacts on understory terrestrial plant communities and sensitive plant species since these species are adapted to growing on a landscape where wildfire was historically an integral component of shaping and maintaining the plant communities where these sensitive species occur. While the actual burning activities are relatively benign, the prep work associated with burning does involve some risk to terrestrial and aquatic sensitive plants in the project area if plants are inadvertently damaged or destroyed. Design criteria have been developed to minimize this risk.

Some species are well adapted to exposure of fire while others such as Yews, moonworts, mountain's ladys slipper and Sierra blue grass are not expected to respond favorably. Direct and Indirect effects to the Sierra bluegrass from prescribed fire are unknown as there is very little information available regarding this species, and its reaction to management activities. Additionally, there is very little evidence of fire scars within the units to indicate previous fire regimen associated with the habitat. Fire-line construction can directly impact terrestrial sensitive plant occurrences by potentially uprooting, crushing, or altering habitat condition (canopy closure, microsite hydrology, covering plants, etc.) if fire-line is constructed through an occurrence.

Potential threats for terrestrial sensitive plants during road construction are primarily the physical disturbance to roadside occurrences. Stebbins' phacelia, and Sierra bluegrass have known occurrences adjacent to or bisected by designated roadways in the project area. Impacts to these known occurrences are not expected since all occurrences will be flagged for avoidance.

Sensitive plant species occurrences within the 200 foot zone adjacent to roads are not expected to incur negative effects by these road activities, as design criteria is in place to protect them. A small portion of one sub-occurrences of Poa sierrae, POSI6_009-01 on road 13N65C, is estimated to cover 2000 square feet and growing in small patches within that boundary. A minimal portion of the occurrence overlap the road and it is possible that the occurrence may be disturbed, however, with design criteria in place of flagging and avoiding, the risk to these plants will be minimal. Sub-occurrence 02 on 13N65B is estimated to cover 9000 square feet and growing in extensive stands, some in rocky chaparral openings. The boundary for this sub-occurrence overlaps the road, however, there were no plants found to be potentially impacted. There are no concerns for the remaining Poa sierra in identified sites within the 200 foot buffer, and no potential for direct effects to these Sensitive plant taxa from road activities. The occurrence of Phacelia stebbinsii (PHST6_009-01) "Population E" is within 200 feet of 13N65C, and there are 26 plants in an undisturbed area. There is proposed road reconstruction on 13N65C, however, it is not anticipated that there will be any direct effects to this occurrence.

For terrestrial sensitive plants, the primary risk for proposed herbicide application is the potential for off-target movement of glyphosate and aminopyralid through drift as well as direct application of herbicides to sensitive plant occurrences. Studies of herbicide effectiveness often assess effects to crop species and undesirable species but do not address a broad range of species. Based on product labels for glyphosate and plants identified in the risk characterization and appendix (SERA, 2011; SERA, 2007), species within the following families (not exhaustive list) may be at risk from spray drift of glyphosate: Alliaceae, Asteraceae, Brassicacease, Cucurbitaceae, Cyperaceae, Lamiaceae, Papaveraceae, Poaceae, Polygalaceae, Rosaceae, and Solanaceae.

According to the SERA risk assessment there is some risk for off-target affects up to 500 feet from application area (SERA National Risk Assessment for glyphosate, 2011) based on a standard drift coefficient, max application rate of 4 lbs. per acre, and a No Observable Effect Concentration (NOEC) of 0.0013 lbs/acre. There is one sensitive plant occurrence, Sierra blue grass, that potentially sould have a direct or indirect effect based on hazard quotients for Glyphosate at 500 feet. However, it is worth noting that the drift models used in the SERA risk assessment are based on broadcast boom applications in an agricultural setting which is expected to exceed the actual drift observed from backpack applications in a forested area (SERA 2011). The stated risk from drift is also contrary to general observations from past herbicide projects on the Eldorado National Forest conducted over the past 20 years where impacts to non-target vegetation from glyphosate drift have never been noted > 25

feet from application areas. Based on this direct experience from herbicide applications on the forest, and the inclusion of design features to limit drift, adverse effects are not expected for sensitive plant species from Alternative 1.

Limited information is available for aminopyralid. When applied by a low boom, ground-based spray, aminopyralid may have some level of effects to sensitive plants up to 100 feet from the application site. Herbicides would be applied with backpack spray (no boom) and have reduced effects. Known or newly discovered Sensitive plant locations would be buffered by a 200-foot aminopyralid exclusion zone; therefore, there would be little risk of death or damage to R5 Sensitive plant species from spray drift.

Potential habitat for a number of sensitive plant species occurs in the project area but occurrences were not found during recent sensitive plant surveys. While survey coverage for the project was extensive, it is still possible that past and recent surveys overlooked existing sensitive plants. If surveys inadvertently overlook sensitive plants, these individuals could be affected by project activities including, fire-line construction, prescribed burning, herbicide application, thinning activities, or road maintenance.

INVASIVE PLANTS

Soil disturbances can provide opportunities for the introduction and proliferation of invasive species (noxious weeds). These species have the potential to quickly outcompete native plants including Sensitive plants for sunlight, water, and nutrients. These species can also form dense monocultures which can alter habitat for Sensitive plant species. Seeds of these species can be carried into Sensitive plant areas on prescribed burning equipment, vehicles, and on workers boots and clothing. The magnitude of this impact is difficult to predict since it is contingent on the introduction of a noxious weed species into an area, an event which may or may not occur. A potential source of introduced invasive species is the importing of gravel used in road construction. Disturbance from fire may offer new opportunities for weed seed introduction, monitoring and follow-up weed treatments would reduce the chance that invasive plants would spread as a result of this project. Existing infestations along roadways generally remain in the road prism possibly spreading along the roadway/powerline, but not into the surrounding landscape. Open conditions created during fuel treatments increase the risk of existing infestations rapidly spreading from the disturbance corridor.

An increase in invasive plants would have adverse effects to potential Sensitive plant habitat and to native vegetation. Timing or season of burning can determine short-term effects. Spring burning may reduce reproduction for that season. For some species, burning stimulates germination of seeds in the seed bank. Although burning may eliminate the aboveground growth of Scotch broom, it also may stimulate a flush of germination (DiTomaso and Healy, 2007). Covering fire lines with on-site, weed-free pine litter and brush may help to inhibit, but not eliminate, germination of invasive plant seeds.

The proposed restoration project is not expected to result in a detectable increase in the spread or proliferation of these non-native species above existing levels. Proposed design criteria for the project, including eradication of known priority infestations is expected to reduce the risk of introducing and spreading high priority noxious weeds in the project area. The threat of noxious weeds (current and future) introduction cannot be completely eliminated for the proposed project or other expected activities in the area. Therefore it is necessary to continue to monitor and control high priority infestations that already occur or may develop in the project area. The ENF noxious weed program is expected to continue monitoring and managing noxious weeds and would take necessary actions to address new infestations if they are discovered in the project area. Continued surveys for noxious weeds are expected to occur during future projects in the analysis area.

Active control measures have been included in this project and are expected to eradicate these infestations. By removing known infestations from the project area the proposed project will reduce the potential for invasive species to spread beyond current infestations within the project area, reducing native vegetation diversity and potentially impacting known sensitive plant occurrences. Of the known invasive plant infestations and sensitive plant occurrences, yellow starthistle and rush skeletonweed are considered the greatest threat to sensitive plants. Beneficial indirect effects are anticipated due to habitat improvements by removing invasive plant species.

Cumulative Effects

Although this project does present some threat to sensitive plant species, design criteria for the current project along with other past and future activities in the area largely minimize impacts to known sensitive plant sites. These mitigation measures are largely successful so potential cumulative effects will be non-significant.

INVASIVE PLANTS

With proper implementation of the design criteria, invasive plant species likely would be spread to some extent by project activities. These effects would be cumulative to those from other activities in and around the project area on both private and NFS land. The ability to treat new and expanding invasive plant occurrences with herbicide is likely to reduce these effects from the Blacksmith Project; however, herbicide exclusion zones along perennial and intermittent streams will limit the ability to effectively treat some invasive plant species. However, Alternatives 1 and 5 are not expected to result in a detectable increase in the spread or proliferation of non-native species above existing levels. With the treatment of existing high priority invasive plant species (e.g., Scotch broom, yellow starthistle and Rush skeletonweed), the contribution to cumulative effects may be beneficial relative to indirect effects on native vegetation. Removal of competing vegetation would, in the long term, benefit habitat conditions for sensitive plant taxa and native vegetation.

Alternative 3

Direct and Indirect Effects

Direct effects for Alternative 3 are expected to be similar to Alternative 1, since the action alternatives will include ground disturbing activities over largely similar areas in the Blacksmith project area. The projected differences in canopy cover between the two alternatives could indirectly affect potential habitat for Sensitive plant species if noxious weeds are introduced into the project area. If this were to occur, Alternative 3 would be slightly less susceptible to noxious weed establishment than Alternative 1 because noxious weeds are generally less competitive when shaded by overstory conifers. If noxious weeds are not introduced into the project area the expected differences in forest structure between Alternative 1 and Alternatives 3 (canopy cover, stand density, etc.) will not substantially alter the quality of potential Sensitive plant habitat within the project area. The negative indirect effects to potential sensitive habitat from ground disturbing activities should be similar for Alternative 3 if it occurs in potential habitat for sensitive species.

Cumulative Effects

Cumulative effects for Alternative 3 will be similar to those described for Alternative 1.

Alternative 4

Direct and Indirect Effects

Effects from Alternative 4 are similar to Alternative 1 except that direct and indirect effects from thinning will be less than Alternatives 1 and 5, and more than Alternative 3 as there will be less acreage of mechanical, commercial thinning and 80 acres of mechanical thinning maintaining a greater than 70% canopy cover. Also, road construction will be slightly less in acreage, however potential threats for terrestrial sensitive plants during road construction are primarily the physical disturbance to roadside occurrences, and are similar to Alternative 1.

Cumulative Effects

Cumulative effects for Alternative 4 will be similar to those described for Alternative 1.

Forest Soils

Effects to forest soils are summarized from Nicita (2013). A combination of site visits, areal imagery and GIS, and modeling were used to evaluate existing soil conditions and potential effects for all alternatives analyzed in detail. For this project, the zone of influence (or activity area) is delineated by the extent of possible ground disturbance. Potential ground disturbing activities include mechanical treatments, herbicide applications, and prescribed fire. The analysis area includes the planning boundary.

Affected Environment

Soil mapping of the project area is based on soil series and slope. Generally the soil series are mapped accurately; however, distinction between soil series is based on rock fragment content, soil depth, climate and soil chemistry. To more consistently evaluate the interpretations of the project soils, the soils were generalized by soil properties with common response to management activities. These generalized soil types are: Cohasset, Granitic, Hartless, Jocal, McCarthy Complex, Shallow, and Wet.

Table 9 Generalized Soils and Project Area Extent

General Soil Type	Alternative								Project Area	
	1		3		4		5			
	acres	% of alt	acres	% of alt	acres	% of alt	acres	% of alt	acres	% of alt
Cohasset	388.4	5.5	303.8	9.4	388.4	6.1	388.4	5.5	1435.1	2.8
granitic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	295.3	0.6
Hartless	12.1	0.2	9.6	0.3	12.1	0.2	12.1	0.2	170.2	0.3
Jocal	1173.5	16.7	654.8	20.2	1096.4	17.1	1173.5	16.6	12656.2	25.0
McCarthy complex	5140.8	73.3	2179.8	67.1	4616.6	72.0	5198.8	73.5	29141.8	57.7
Shallow	302.0	4.3	99.3	3.1	296.8	4.6	302.0	4.3	7796.0	15.4
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	0.1
Total Acres	7017		3247		6410		7075		51535	

Because many of the activities that caused existing ground disturbance within proposed treatment areas occurred several decades ago, natural processes have remediated much of the disturbance. The soils within the analysis area are generally have functional infiltration and soil productivity with low levels of residual disturbance from past activities. There were eleven units, however, where existing ground disturbance approached or exceeded Forest Plan Standards and Guidelines for unacceptable soil conditions; 322-22, 323-31, 323-33, 323-37, 323-38, 323-39, 324-33, 325-02, 329-45, 329-46, and 330-23. Generally site prep done for planting in plantations is observed to have created enough displacement that plantations are considered highly impacted. Large woody debris (16" diameter) is generally adequate throughout the project area except for plantations.

Two dispersed camping areas were identified as potential restoration sites during soil traverses as the soils in these sites are compacted, surface runoff is accelerated, and soil productivity is impaired.

Fire exclusion has changed the fuel loads on the soil such that both diverse vegetative communities with which the soils have evolved with have been altered, and the risk of destructive effects on the soil have been elevated.

Colonies of invasive plants exist in the project area and are affecting soil productivity. Potential effects of invasive plants include: reduced soil organic matter, reduced infiltration, loss of soil cover,

increased soil erosion, suppressed soil biotic activity, and disrupted soil nutrient cycling. However, the extent of disturbance from invasive plants is relatively small.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

There would be no activities that would directly affect soils within the project area with this alternative. Additional compaction and displacement would not occur and continued natural recovery would continue.

Canopy cover is expected to continue to increase in most units for the short term. Closed canopy stands within the analysis would likely reduce the understory vegetative diversity (Wayman 2006) and not support healthy understory communities. Soil nutrient cycling by micro flora and fauna may, therefore, be suppressed.

As fuel load and fire conditions overwhelm the ability of fire control efforts to suppress wildland fire, it becomes increasingly likely that a catastrophic high-severity fire will occur within the project area. Following high-intensity wildland fire, severe nitrogen loss occurs when total fuel loads exceed 20 tons/acre (Brown et. al. 2003. Soil burning is expected as a result of high intensity fires.

The risk of sedimentation increases as the risk of stand-replacement fire increases. According to WEPP derived values, the T-factor would be increased as much as 300%. This sudden release of sediment would have negative effects for downstream uses and soil productivity. Erosion Hazard Ratings would be high in all instances. The extent of reduced soil productivity due to invasive weeds would increase and accelerated erosion would continue to occur in infested areas.

Cumulative Effects

Cumulative effects would not occur with this alternative.

Alternative 1, 3, 4 and 5

Direct & Indirect Effects

Within units treated under an action alternative, effects would be similar under any action alternative. For areas not treated in an alternative, effects of no treatment would be similar to those described in Alternative 2.

Road Work

Road reconstruction would have little direct effect on soil resources because the road tread is already disturbed. However, because road drainage would be improved, the risk of gullying of the road tread would be reduced. Constructed temporary roads would be rehabilitated therefore detrimental disturbance of all activities would be kept below 15 percent.

Seven of the nine identified new road construction segments are in units analyzed for mechanical treatments. Detrimental disturbance of all activities would be kept below 15 percent

Mechanical Treatment including Thinning and Piling

Direct soil loss would occur during mechanized operations. Soil loss would primarily occur as displacement during the development and use of skid trails, landings, and fire lines. The amount of soil loss is dependent on the character of a site and the skill level of machinery operators, therefore the extent of soil loss directly caused by mechanized operations is difficult to predict, but would not exceed 15 percent cumulative disturbance in any given unit.

Soil porosity reduction resulting from skidding would occur due to mechanical treatments. There would likely be a small increase in new skid trails and landings where existing skid trails and landings do not meet the needs of current objectives. Because existing skid trails are located throughout many proposed mechanical units, it is likely new skid trail location will contribute less than a 5 percent increase in ground disturbance. Re-use of existing skid trails and standard harvest unit layout would limit cumulative disturbance to less than 15 percent of any one unit. For those units that are currently above soil disturbance thresholds, no new disturbance is expected above the current footprint and ripping is proposed as a mitigation to ensure units remain below that threshold.

The soils within the project area are sandy loams and loams and not prone to severe compaction. Most soil compaction occurs within three passes of log laden equipment (Williamson and Neilson 2002, Grigal 2000); therefore, detrimental soil compaction is primarily expected to be found on skid trails. Without remediation, compaction on skid trails and landings can last for decades as confirmed by existing disturbance surveys and literature (Grigal, 2000), however with ripping this effect will be minimal. The Jocal soil group is most prone to compaction when moist, but BMPs such as limiting operations periods to when soils are dry would mitigate compaction on these soils and limit extent to below Forest Plan Standards and Guidelines.

Compaction currently exists and is expected to increase on skid trails. Compaction resulting from single to double pass harvesting off skid trails is not expected to be ground disturbing. Between skid trails, porosity reducing activities would be limited to a pass associated with tree harvest and, potentially associated with machine piling. Excessive organic material in the commercial stands would minimize compaction associated with harvesting.

WEPP modeling values for all soil types with mechanical treatment are less than 1 ton/acre which is less than the soil creation value (T-value) for all soils. Therefore, soil loss from erosion following tree removal would be considered within the range of desirable conditions. The Erosion Hazard Rating (EHR) resulting from mechanical activities for all soils in the project area would maintain a

"Moderate" rating. BMPs applied to skidtrails and landings are designed to keep EHR values at moderate.

Even though the commercial stands currently have adequate to excessive litter cover, harvesting activities would result in displacement of some litter cover and organic matter. This displacement would be limited to skid trails, landings and limited areas within the harvest area. Expected seasonal needle fall and application of Best Management Practices would limit this effect to the season following harvest activities.

Thinning will decrease the over story canopy cover and shift the under story component from being nearly absent in closed stands to having a stronger herbaceous and shrub under story. Soil textures and water-holding capacity of all the project soils promote strong herbaceous response. This response would be most pronounced on south aspect units where the majority of activities are planned. Indirect effects are expected to include increased carbon and nitrogen mineralization which may increase the long-term productivity of the soil and improve soil structure.

Skyline

It is expected that feller-bunchers would occasionally cause deep displacement while turning on the slopes in the skyline units. The loss is expected to be localized and mitigation including filling in divots with the harvesting head are expected to minimize any impact. Soil loss along skyline corridors is expected to be minimal with this project. Soil loss would be reduced with the installation of water bars and spreading of organic slash where one end-suspension exposes soil. Very little displacement of existing organic material is projected to occur so values for modeled erosion would not be expected to change.

Soil cover would be similar or greater than the existing condition; therefore Erosion Hazard Rating would be maintained at Low between skyline corridors. On skyline corridors, mitigation for soil cover displacement and potential berms would likely not cause EHR to exceed moderate. Installation of water bars, removal of berms to minimize runoff concentration, and placement of slash and coarse woody material to retain transported soils, are expected to be sufficient to maintain EHR ratings of Low with the proposed project. Grapple piling on 8 acres of skyline units is expected to retain soil cover.

In the two years following activities a strong understory community would likely develop on all aspects except north. There may be short distance displacement of organic matter from harvesting activities.

Harvesting by feller-buncher and grapple piling of 8 acres would be the only activity that could increase soil compaction. The effects would be similar to the effects listed under mechanical activities.

Mastication

No soil loss resulting from mastication is expected directly or indirectly. Mastication increases soil cover to high levels reducing the risk of displacement and decreasing erosion to rates less than no activity. If a masticated unit has a pre-activity soil cover of less than 100%, any additions of soil cover would increase the soil hydrologic function of the soil by providing thermal cover, increasing rooting zone activity and decreasing peak water runoff. Within the plantations and shrub communities, mastication would increase soil cover. Compaction would be limited to isolated pockets where the masticator turns on steeper slopes.

Large woody debris is expected to remain unchanged because large woody debris would be retained during mastication. Fire does pose a risk to organic matter if masticated material burns in an uncontrolled fire. The effects would be dependent on fire characteristics and accumulated material following mastication.

Herbicide

Because herbicide treatments would be applied by back-pack spray methods, soil porosity would be reduced negligibly. Herbicide applications would not be expected to accelerate soil loss because soil cover would likely increase and porosity would remain unchanged. Herbicide treatments defoliate shrubs with the resulting leaf fall increasing soil cover. Herbicide applications would not affect coarse organic material or the nutrient rich humus within the soil profile, but would affect fine organic matter. Although the toxicity to microbes for both herbicides is considered 'Low', there has been question about the toxicity of Glyphosate to the soil microbial community. These effects are primarily determined by the inherent toxicity of the herbicide and soil properties that influence the extent to which herbicide residues are persistent and mobile in the environment. Although there is a slight risk to soil microbes, the relatively short half-lives of the proposed herbicides would suggests a recovery within a year. It is worth mentioning that glyphosate has been shown to be very toxic to microbes grown directly on this herbicide in the laboratory, but has un-measurable effects on microbes compared to treatment controls when applied directly to soil in the laboratory or in the outside environment (Busse, et al. 2001).

Prescribed Burning

Because most units use existing roads and created skid trails as fire lines, excessive soil displacement resulting from fire lines is not expected. There are minimal differences in potential soil loss between soil groups. Immediately following burning, erosion rates are expected to be elevated but rapid colonization of bear clover and deposition of needle fall would reduce that rate rapidly as seen in the Hartless, Quintette, and Last Chance prescribed fires. Expected revegetation does not apply, however, to inner gorges due to the low light conditions that are not conducive to rapid understory growth. Soil porosity is not expected to be affected by prescribed fire.

Soil loss resulting from prescribed burning in inner gorges could exceed soil creation values (T-values) for the McCarthy and Jocal soil groups in these sites. For the McCarthy soil group, the T-value is 2

tons/acre/year and the modeled average erosion rate is 2.5 tons/acre/year. For Jocal, the erosion rate doubles the T-value (2 vs 4.2 tons/acre/year). Erosion rates were modeled in a worst case scenario of a 35% hillslope upslope of a 75% slope inner gorge and, although this scenario does not exist on a majority of the burning area, inner gorges are the most sensitive in regards to soil stability and potential sediment delivery to the hydrologic system. To mitigate for excessive erosion and sedimentation, post fire monitoring of these areas and follow-up actions described in the design critiera would occur where appropriate.

A reduction in soil cover resulting from prescribed fire would be expected. Although much of the surface soil organic material would be consumed, little heat penetration would be expected to occur and volatize the soil organic matter in the soil profile. Small areas of moderate intensity fire could occur in which soil organic matter would be burned, but is not expected to exceed 15% extent of the project area.

All fires have the potential to volatilize soil organic matter. The resulting organic vapor can coat soil particles and create soils that are water repellant. Water repellant soils delay the timing of infiltration and subsequently increase surface water flow. This delay in infiltration effectively reduces the hydrologic function of the soil. The soils in the project area have natural soil repellency but the prescribed burn is likely to increase the extent and severity. Water repellency depends on soil type and burn intensity. Because of the mosaic nature of prescribed burns, the change in extent and severity of hydrophobicity cannot be predicted but is expected to slightly increase but any increase is not expected to persist for more than two years.

Both WEPP modeling and Erosion Hazard Rating analysis analyzed the effects of water repellency. Water repellency in a low intensity burn is short-lived not expected to persist more than two years.

Cumulative Effects

All proposed units were either observed on the ground or using aerial photography; all but eleven units conform to Forest Plan Standards and Guidelines for soil disturbance. Primary skid trails and landings reflect existing detrimental soil disturbance whereas disturbance that resulted from single-pass hauling is no longer evident. Although the productivity and hydrologic function of skid trails and landings are impaired, they are revealed to be recovering with time as evidenced by platy structure converting to blocky structure. The effect of re-using the skid trails will reverse the natural recovery and although the extent of detrimental disturbance will not exceed Forest Plan standards, disturbance will nonetheless increase. Existing landings account for the greatest long-term disturbance. Because existing landings will be re-used and new landings will occupy a small percentage of units, the extent of disturbance will not substantially increase and likely not push units over threshold values of disturbance. Targeted decompacting of skid trails and landings in units that exceed or approach Forest

Plan Standards and Guidelines is expected to reduce the number of units that exceed threshold values for ground disturbance. No future activities are currently planned.

Water Quality / Hydrology

Norman and Tolley (2013) analyze the impacts to the hydrology resource that are likely to result from the Blacksmith Project. Effects are summarized here. The analysis area for the hydrology resource includes thirteen HUC7 watersheds that intersect units of the Blacksmith Project. HUC7 is the finest scale for which the Eldorado National Forest has current watershed data and is the scale at which the forest calculates cumulative watershed affects.

A Riparian Conservation Objective analysis (Grasso, 2013a) further evaluates whether activities proposed with the Blacksmith Ecological Restoration Project (ERP) would be consistent with Riparian Conservation Objectives (RCOs) specified in the Final Supplemental Environmental Impact Statement, Sierra Nevada Forest Plan Amendment (SNFPA, USDA Forest Service 2004).

Affected Environment

The Rubicon River is a fifth order perennial tributary of the Middle Fork American River. Beneficial uses for the Middle Fork American River, from the source to Folsom Lake, include: municipal and domestic supply; irrigation; stock watering; power; contact and non-contact recreation; canoeing and rafting; cold freshwater habitat; potentially, warm freshwater habitat; cold water spawning; and wildlife habitat.

Mean annual precipitation is generally between 50 and 60 inches within watersheds containing the project area. Elevations below 3,500 feet are expected to receive precipitation mainly in the form of rain, while elevations above 6,000 feet are expected to receive precipitation mainly in the form of snow. Portions of watersheds that lie in the transient snow or rain-on-snow zone, which occurs at elevations between 3,500 and 6,000 feet, tend to be more susceptible to watershed effects than portions of watersheds that receive precipitation primarily as rain or snow alone. All treatment areas occur within the transient snow or rain-on-snow zone.

In 2010, all USFS lands were evaluated for watershed condition at the HUC6 watershed level, utilizing a national assessment process (USFS, WCA, 2011). There are 3 possible ratings utilizing this protocol, fully functional, at risk, and impaired. The HUC6 watersheds that encompass these HUC 7 watersheds were all rated as functioning at risk. The impairments that resulted in this rating are primarily due to the past impacts of hydraulic mining, grazing, timber harvest, and road construction. Ten of the HUC7 watersheds drain into the Rubicon River, either directly or via tributaries. Three of the HUC 7 watersheds are tributaries that drain into the Middle Fork of the American River.

Environmental Consequences

Alternative 2

Direct & Indirect Effects

Under Alternative 2, the potential for impacts from project related activitieis would not occur, however the potential for wildfire would be increased as described in the Fire and Fuels Report for the project. In the event of a high intensity wildfire, an increase in water yield and storm-flow may occur as a result of vegetation loss and soil hydrophobicity. Increases in post-fire turbidity and sediment may occur from both the fire and fire suppression activities. Sediment yield as a result of fire varies widely, ranging from 3 pounds per acre to over 98,000 pounds per acre, with higher sediment yields typically associated with steeper slope gradients and higher intensity burning (Winters et al. 2004). Increases in nutrients and chemicals (such as nitrate, nitrite, sulfate, pH, total dissolved solids, and turbidity) delivered to stream channels and reservoirs as a result of wildfire are also possible. Should a high intensity wildfire occur, changes to stream morphology may happen as a result of increases in water, sediment, debris, and LWD delivered to channels.

Cumulative Effects

Cumulative effects would not occur under this alternative.

Alternative 1

Direct & Indirect Effects

Direct and indirect effects to water quality and aquatic habitat in the Blacksmith Project area and downstream of the project area are expected to be minor or negligible, with the implementation of Regional and National BMP guidance and design features as identified in Chapter 2 of the EIS. Therefore adverse impacts to beneficial uses of water in the watersheds are not expected. As a result, the Project is expected to meet the Riparian Conservation Objectives (RCOs) in the Sierra Nevada Forest Plan Amendment, Record of Decision (SNFPAROD) of 2004.

HYDROLOGY

Timber harvest, vegetation removal, prescribed fire, road construction and use, tree planting, and associated activities, have potential to affect hydrology within watersheds. Changes in canopy structure have the potential to increase runoff from harvested sites by altering snow accumulation and melt rates and reducing the amount of precipitation trapped and evaporated from the forest canopy. Fire may result in increased total water yield and storm-flow discharge from the watershed by removing vegetative cover, creating openings where spring snowmelt is more rapid, accelerating melt rates by scorching ground materials and tree boles, and reducing infiltration by causing soil hydrophobicity. Road construction and use, as well as other activities that remove vegetation and/or compact soil (such as skid trails, fire lines, and landings) may alter drainage patterns, decrease infiltration, and increase surface runoff. Changes to water yield, peak flow, and timing of flow due to Alternative 1, however, are expected to be negligible and/or not measurable in most of the watersheds

affected by Alternative 1. Even when considering the amount of area proposed for treatment under both this project as well as the Big Grizzly project (2012 through 2014), as well as existing compacted/barren areas, the maximum area estimated to be either compacted, or barren is expected to be less than 15% in any individual watershed. Stream flow increases are generally not measurable until about 15% of the area of a forested watershed is compacted or barren.

The effects of prescribed fire treatments on water yield and storm-flow is dependent upon the amount of vegetation loss and soil hydrophobicity on slopes and along the stream channel that result from the burn. Burning of piles may also result in areas of hydrophobic soils and poor vegetative regeneration. Prescribed fires of low intensity that are conducted in accordance with best management practices (BMPs) and meet LRMP standards and guidelines would not generally be expected to produce large areas of hydrophobic soils.

WATER QUALITY

Timber harvest, vegetation removal, prescribed fire, road construction and use, and associated activities, have potential to affect sediment delivery, and resultant turbidity, within watersheds. Timber harvest activities, particularly those that cause the greatest amount of site disturbance, such as tractor skidding, have the potential to increase surface erosion or rilling that may result in sediment delivered to aquatic features. Rates of increase of erosion and sedimentation due to prescribed fire are dependent upon various factors such as soil, slope, vegetation, fire characteristics, and weather patterns, with high intensity burning on steep slopes generally having the greatest potential to increase sediment delivery (Winters et al. 2004). Increases in suspended sediment concentration and turbidity levels due to project activities, however, are expected to be minor or negligible. Increases are most likely to occur during and following large rainfall events and, should they occur, would not be expected to cause drainages to exceed state water quality standards for turbidity and sediment. The main reasons for this conclusion are listed below:

- Of the 1.5 miles of new road construction only 0.41 miles will be in close proximity (less than 300 feet) ephemeral channels, including two ephemeral channel crossings.
- Most of the new road construction is proposed in the Middle Long Canyon watershed, which is not modeled to have a high risk for cumulative effects (1.1 miles).
- Most road work within the watersheds will consist of road reconstruction and maintenance, which is intended to improve road drainage on existing roads.

The BMPs to protect soil, water, and riparian resource as further described in Design Features described in Chapter 2 and Appendix B and D of the EIS, are expected to minimize the amount of sediment delivered to drainages and special aquatic features within the project area. These protection measures include zones of no ground disturbing activity, zones of restricted fire ignition, and zones of herbicide exclusion that have been designed to minimize sediment inputs into aquatic features from project activities. Buffers tend to be narrower where topography is flat, and where activities such as mastication, are expected to leave greater groundcover.

Effects of road work on sediment delivery would be expected to vary with the existing condition of the road and the type of activities undertaken. A road with no traffic that has become covered with vegetation, for example, may have erosion rates reduced by as much as 99 percent (Elliot, Foltz, and Robichaund 2009). Maintenance activities that remove armor layers that have developed over time on road surfaces and in ditches may lead to increases in surface erosion up to six times greater than untreated roads (Grace and Clinton 2007). Activities that reduce the loss of existing native surface material (such as road rocking), however, would be expected to decrease sediment delivery potential.

Many roads to be reconstructed or maintained create the short term potential for sediment generated by road work to reach aquatic features. Implementation of best management practices, however, would be expected to minimize the effects of road work on aquatic features. Based on best management practices evaluations conducted from 2008 through 2012 , on road surface, drainage, and slope protection (6 evaluations), and stream crossings (3 evaluations), BMPS were rated effective for 8 out of the 9 evaluations, with one evaluation rated at risk (Query of USFS Region BMPEP Database, 2013).

The effects of prescribed fire treatments on water quality would be a function of the resultant spatial patterns of the burn and burn severity. Prescribed fires of low intensity that are conducted in accordance with BMPs and retain sufficient post-burn ground cover will likely result in limited increases in sedimentation and turbidity. Additionally, published research indicates that the effects to water quality from prescribed fire are usually small when vegetated buffer strips, which can act as filter strips for sediment and other constituents, are left next to streams (MacDonald and Stednick, 2003).

TEMPERATURE

Within the Blacksmith Project increases in temperature of intermittent and perennial streams, and resultant changes in dissolved oxygen levels, are expected to be minor or negligible, and would not exceed the state water quality standard for temperature. The main reasons for this conclusion are most mapped streams within project units are first-order ephemeral drainages, which because of limited time and duration of stream flow, are not expected to influence stream temperature changes.

PESTICIDES

Within all aquatic features of the project, and downstream in the Middle Fork American River and Oxbow Reservoir, pesticide levels in water are expected to remain either below the detection limit or below the maximum contaminant levels for domestic water supplies.

Most project units treated with herbicide would receive treatment with glyphosate[1]. Glyphosate tends to bind readily and strongly to soil particles, does not leach through most soil types, mostly (~90%) decomposes to its natural components within about six months, and does not bioaccumulate (SERA, 1997, SERA, 2003). Monitoring results, based on over 150 surface water samples taken at locations in National Forests in California between 1991 and 2002, appear to indicate that glyphosate applied by ground application seldom reached surface water even with "no spray" buffer widths as narrow as 10 feet (Bakke, 2001; Frazier and Grant, 2003). The highest concentration of glyphosate measured by the US Forest Service in Region 5 since 1991 was less than 30 micrograms per liter (ug/L), while the Maximum Contaminant Level (MCL), as set by the Environmental Protection Agency, for glyphosate for human health is 700 ug/L. In addition, approximately 99 percent of the stream samples tested had concentrations less than the laboratory detection limit. The Minimum Detection Limit for glyphosate is 1 to 25 ug/L. The few instances where glyphosate has been detected in surface water have almost always been traced to accidental spills directly into a stream, the intentional spraying of the stream surface, or the spraying of vegetation on the streambank or on gravel bars in the channel (Bakke, 2001). Additionally, herbicide monitoring for glyphosate in surface water performed on the Eldorado National Forest between 1993 and 2007, showed no detection of glyphosate in any of 29 samples (Markman, 2008). Aminopyralid is moderately persistent and highly mobile. Its high water solubility suggests a high potential for runoff into surface water and leaching to groundwater (USEPA, 2005). Once it reaches a waterbody it is expected to persist. In the unlikely event that a spill should occur, a site-specific safety and spill plan designed to address site specific attributes of proposed treatment units will be in place at the time of implementation.

CHANNEL CONDITION

Sediment delivery, which may result from ground disturbing activities, may result in channel simplification (e.g. decreased pool depth and abundance) and clogging of stream substrate. Harvest of trees near the channel may lower potential for future recruitment of large woody debris to the channel, resulting in reduced sediment storage sites and fewer scour pools. Prescribed fire may either consume downed large woody debris or, if streamside fire intensity is high, it may increase large woody debris delivered to stream channels. Road crossings may alter channel geometry and substrate armoring at crossings. Pesticide use near channels may result in altered channel stability due to change in root structure.

[1] For both glyphosate and amionpyralid, the primary adjuvant to be used is SYL-TAC (or equivalent) and the colorant to be used is Colorfast Purple or equivalent. SYL-TAC is a blend of organosilicon surfactant and modified vegetable oil concentrate. Colorfast Purple is a commercial dye product containing various constituents, including Basic Violet 3, dipropylene glycol, and acetic acid (SERA 1997). Both Colorfast Purple and SYL-TAC are water soluble. Information on environmental fate of either product appears to be limited. Buffers for glyphosate and triclopyr would limit the application of Colorfast Purple and SYL-TAC, however, and product labels must be followed (consistent with BMP 5-8).

Adverse impacts from project activities to existing stream morphology within the project area and downstream of the project, however, are expected to be minor or negligible. The main reasons for this conclusion are listed below:

- With application of design criteria and BMPs, the project is expected to produce minor or negligible increases in suspended sediment, turbidity, or streamflow and thus would not be expected to produce significant changes in existing morphologic characteristics of stream channels.
- Zones of no ground disturbance, limited ignition, and "no spray" herbicide buffers included in the design features are expected to minimize direct disturbance of stream banks and changes in near-channel root structure.
- A decrease in large woody debris to streams within the project area may occur, however, large woody debris remaining is not expected to be reduced below levels sufficient to maintain channel structure in intermittent drainages and ephemeral drainages with a riparian microclimate. Increases in down wood debris may occur at some locations. Research has shown that approximately 96 percent of the large woody debris that reaches streams is from a ground distance of one site potential tree height of the stream channel (Reid and Hilton 1998). Site specific protection measures for RCAs include no harvest zones that are expected to maintain an adequate renewable supply of large down logs within this area. Fire intensity high enough to substantially increase large woody debris to stream channels is generally not expected assuming burn plan objectives and Protection Measures are met.

Cumulative effects

The analysis of cumulative watershed effects (CWE) considers all past, present, and likely future land effects in a given drainage area. In the Eldorado National Forest, the risk of the occurrence of CWE is based on a quantitative evaluation of the land disturbances in the watershed using the method of Equivalent Roaded Acres (ERA). One of the major influences in the results of the CWE analysis is factoring in the effects of the Big Grizzly Fuels reduction project, in addition to the Blacksmith Ecological Restoration Project.

Table 10 Cumulative Watershed Effects in terms of percent ERA by 7th Field Watershed for the Blacksmith Restoration Project.

Watershed	Acres	Current (% TOC)	Projected ERA (% TOC) (2015 / 2021)	Current Risk	Projected Risk
Middle Long Canyon	6140	31	57 / 63	Low	Mod / Mod
Rubicon R. - Stony Cr.	7305	44	47 / 50	Low	Low / Mod
Wallace Canyon	8353	45	62 / 58	Low	Mod / Mod
Big Grizzly	4318	81	90 / 80	High	High / High to Moderate
Rubicon R. - Leonardi Spr.	7100	47	56 / 60	Low	Mod / Mod
Rubicon R. - Pigeon Roost	7076	34	42 / 37	Low	Low / Low
MFAR - Brushy Canyon	9202	37	59 / 53	Low	Mod / Mod
Lower Long Canyon	5555	49	52 / 47	Low	Mod / Low

Watershed	Acres	Current (% TOC)	Projected ERA (% TOC) (2015 / 2021)	Current Risk	Projected Risk
Lower Rubicon River	8261	24	25 / 24	Low	Low / Low
MFAR - Big Mosquito Cr.	9227	20	26 / 24	Low	Low / Low
MFAR-Chipmunk	7285	35	31 / 27	Low	Low / Low
NF Long Canyon	4196	58	54 / 47	Moderate	Mod / Mod
SF Long Canyon	7120	33	32 / 29	Low	Low / Low

In most cases watersheds that were treated more heavily under the Big Grizzly project are proposed for less activity under the Blacksmith project, and visa versa. Based on this method of analysis of existing conditions, and estimated future actions the risk of cumulative watershed effects remains low in 5 watersheds, and remains moderate in 1 watershed, increases from low to moderate in 6 watersheds and remains high in 1 watershed, Big Grizzly Creek, with an increase in the %TOC from 81 to 90 percent in 2015. The primary reason for the increase in %TOC in the Big Grizzly creek watershed is from the actions that have and will be taken in this watershed under the Big Grizzly project (total of 1,110 acres treated, of which 780 are mechanical thinning and fuels treatments).

The CWE model is still a relatively coarse way of evaluating the effects of past and future actions, and could be considered as a conservative estimate, meaning the calculated ERAs are likely greater than what is really occurring, since the model is too cumbersome, and data not readily available, to tease out areas where past treatments overlap. Although the Big Grizzly watershed is considered to be under the threshold of concern, as evaluated using the model described above, there is other information that is relevant for determining whether the watershed is experiencing cumulative watershed effects, as evidenced by observations of wide scale main channel instability. Channels become destabilized when sediment and flow regimes are altered to the point that the channel is no longer able to transport these flows without experiencing accelerated erosion as exhibited by large scale headcuts, channel incision or channel widening and evulsion.

There has been evidence of main channel instability documented in the upper Big Grizzly Creek main stem as early as 1988 (USFS, Stephan and Kuehn, 1988). A Watershed Restoration and Monitoring Plan prepared in 1993 (USFS, Gecy, 1993) recommended a number of restoration actions to stabilize source areas of sediment and altered hydrology within the watershed (landing, roads, skid trails) as well and in-channel stabilization. In the 1993 report it was acknowledged that limited information existed on the health of the stream lower in the watershed. This report states that the results of 1991 and 1992 fisheries survey show generally stable conditions in downstream sections and that sedimentation was not occurring, and a 1993 macroinvertebrate survey indicated a healthy aquatic community. But the report also states that existing data does not establish long term trend, and a need for additional sampling. Although some restoration was implemented as a result of this plan, some of the identified problems were deferred due to limited funding.

Restoration was not revisited in this watershed until 2009, when a second restoration project was planned as part of the Big Grizzly project, again focused on the watershed and mainstem in the upper part of the watershed. This project implemented in 2012, ripped old logging roads and landings in proximity to the stream, restored several hundred feet of skid road, installed road BMP retrofits, and removed debris and encouraged a single thread flow path above and below a head-cut area, along with some alder and willow planting. In a recent 2013 survey of the stream it is now thought that the geomorphic adjustments occurring in the mainstem in the upper watershed is actually a reflection of natural dynamic geomorphic processes, and is not reflective of a destabilized condition. The current interpretation of existing data/surveys, is that stream channels within the Big Grizzly watershed are currently in a state of dynamic equilibrium, and do not show signs of degradation as a result of watershed destabilization.

Alternative 3

There is considerably less burning proposed in alternative 3, only 300 acres compared to approximately 3,700 acres in the other 3 alternatives (driven by calculated timing and funding constraints). This reduction in burning occurs primarily in Stony Creek, Leonardi Spring, and Middle Long Canyon watersheds in alternative 3. This is a substantial reduction in burning in these three watersheds and the potential for adverse soil and water quality impacts (if prescribed fire BMPs were not implemented or effective) would be less. However the risk of soil and water impacts in untreated areas could be higher if these areas are burned in a wildfire.

Cumulative Effects

Cumulative Effects would be similar to Alternative 1.

Alternative 4

Alternative 4 propose approximately 500 acres less of mechanical treatments than the other 3 action alternatives. The watersheds in which mechanical treatments are reduced the most is in Alternative 4 within the Pigeon Roost Canyon (150 acres less) and Middle Long Canyon watersheds (200 acres less). There is also slightly less road construction (0.4 miles less), in Middle Long watershed in Alternative 4. This level of reduced activity is not expected to result in any measurable or significant difference in potential for hydrologic or water quality impacts, when compared to the other alternatives.

Cumulative Effects

Cumulative Effects would be similar to Alternative 1.

Alternative 5

There are small increases in mechanical thinning in this alternative (spread over multiple watersheds), with commensurately less burning then proposed for Alternatives 1 and 4. The dispersed nature and relatively small scale of these differences is not expected to result in any measurable or significant difference in potential for hydrologic or water quality impacts, when compared to the other action alternatives.

Cumulative Effects

Cumulative Effects would be similar to Alternative 1.

Aquatic Wildlife

Direction to maintain the viability of Region 5 endangered, threatened, and sensitive species is provided by the National Forest Management Act, the Code of Federal Regulations (CFR 219.19), the Forest Service Manual, FSM 2672, and the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement (EIS) (USDA Forest Service 2004). Effects to aquatic wildlife potentially affected by this project are summarized from Grasso (2013).

Threatened and Endangered Species

California Red-Legged Frog

Affected Environment

There are four documented occurrences of California red-legged frog (CRLF) on or near the Eldorado National Forest: Bear Creek/Little Silver Creek area (Georgetown Ranger District), Ralston Pond (Georgetown Ranger District), Sopiago Creek (Amador RD), and Spivey Pond – Weber Creek on Bureau of Land Management land. No Critical Habitat or Recovery habitat has been designated within the project area. The nearest known CRLF population is Michigan Bluff – Big Gun (Tahoe National Forest), approximately 2.75 miles northwest of the project area (Ralston Pond) which contains a known breeding population. The nearest known CRLF sighting was in 2001 by Forest Service personnel where 1 adult was observed in Ralston Pond (10S 0723155; 4268521) located within the project area boundary and near treatment unit 325-007 (proposed for mastication/herbicide). In a Biological Opinion [81420-2008-TA-0986-1] to the Placer County Water Agency (PCWA) the US Fish and Wildlife Service (USFWS) replied "Because no frogs have been identified as occupying the Ralston Ridge site in the years following its 2001 discovery, it is possible that this site represents dispersal habitat for the frog." PCWA conducted full protocol surveys during the breeding and non-breeding period on Ralston Pond in 2009. No CRLFs were detected. The pond was resurveyed (2 day, 2 night) in April/June 2013 during the breeding season. No CRLFs were observed. It is likely that the pond goes dry by July 1st in most years when the breeding season ends and does not provide habitat long enough to support breeding.

Environmental Consequences

All Alternatives

Direct, indirect effect, as well as cumulative effects to CRLF are not expected under any of the alternatives. This conclusion is based on the facts that the nearest known population (Michigan Bluff) is approximately 2.75 air miles northwest of project treatment Unit 325-007 which contains Ralston Pond, Ralston pond serves only as dispersal habitat with no additional sightings since 2001, and the low-suitability (breeding and dispersal) along with a lack of historical occurrence data within the large and major rivers, moderate rivers, and smaller tributary streams of the project area. Given this information, a "no effect" determination was reached for CRLF and no further analysis was performed, and consultation with the US Fish and Wildlife Service was not initiated.

Sensitive Species

Foothill Yellow-Legged Frog

Affected Environment

Foothill yellow-legged frogs (FYLF) are found in or adjacent to rocky streams in a diversity of habitats such as valley-foothill hardwood, valley-foothill hardwood- conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and various wetland types. In California, west of the Cascades and distributed the length of the western flank of the Sierra Nevada Mountains to Kern Co. The max upper elevation extent for foothill yellow-legged frog on the Eldorado National Forest is believed to be closer to 4,500 feet.

Existing Surveys and Sightings

The majority of the project area has undergone extensive surveys for FYLF under the recent Middle Fork American River Project (FERC 2079). Known occurrences of FYLF exist on Middle Fork American River, North Fork of Middle Fork American River, Long Canyon Creek, and Rubicon River. Occurrences on the Middle Fork American River near the confluence of Brushy Canyon were rare, and FYLF were not observed upstream of this point which was also listed as having limited suitability for breeding and non-breeding habitat. However, below the confluence to Ralston Afterbay, FYLF were common and eggmasses were present. FYLF were not observed on Long Canyon Creek from the confluence with the Rubicon River to diversions near the headwaters. Habitat in Long Canyon was deemed unsuitable (breeding and non-breeding) from the confluence with the Rubicon River upstream to the confluence with Wallace Canyon, but suitable from this point upstream for breeding and non-breeding habitat. Within the Rubicon River drainage, FYLF was listed as common – abundant about 1 mile downstream of the confluence of the South Fork Rubicon River with eggmasses present. Upstream of this point no FYLF or eggmasses were observed, but suitable habitat for each was recorded all the way to Hell Hole Reservoir as well as the South Fork Rubicon to approximately 4,500 feet in elevation. Blacksmith project level surveys did not result in any FYLF detected during 2011,

2012; or during surveys (2008 & 2009) for the Big Grizzly Project which contains some overlapping watersheds.

Environmental Consequences

Alternative 2

Direct & Indirect Effects

Under this alternative, fuels would not be reduced, but would continue to accumulate. The risk for high severity wildfire would remain or increase, with the possibility of stand replacement mortality for much of the project area. No action could lead to a greater risk of erosional effects to aquatic features during periods of increased run-off and snowmelt in the years following a high-severity wildfire than Alternatives 1, 3, 4, and 5.

The hydrologic response of erosion rates after a high severity wildfire is increased by two or more magnitudes for several years post-fire and returns to near pre-wildfire levels within four or five years. However, the effects to aquatic features and beneficial uses of water both within and downstream of a high severity wildfire are difficult to predict in fire suppressed landscapes and depend on many factors. The single most important factor is often the size of the rainfall event that occurs during the first several years after the wildfire when the ground is most vulnerable to accelerated runoff and erosion. Tree mortality (snags) in riparian zones as a result of wildfire may contribute to large woody debris recruitment that is lacking in most drainages and remain elevated for the next 10 – 15 years post-wildfire (Gresswell 1999). There would be no direct or cumulative effects to FYLF or its habitat as the result of project activities not being implemented under Alternative 2. However, effects to FYLF from potential wildfire under Alternative 2 from the lack of fuels reduction related activities could negatively affect FYLF aquatic habitat by an increase in sediment deposition to streams where they occur or suppress recolonization in unoccupied but suitable habitats.

Cumulative Effects

Cumulative effects would not be expected with this alternative.

Alternative 1

Direct & Indirect Effects

Since FYLF have been detected in the project area this species has the potential to be affected by project activities in Alternative 1. However, since FYLF is highly associated with water within stream channels, meadows and ponded areas in conjunction with project design features, any direct or indirect effects to FYLF or aquatic habitat are expected to be minimal and limited to treatment areas within RCAs. Potential adverse effects to FYLF include mortality or injury from equipment and falling trees, harassment from noise and ground vibration, reduction in structure that may alter habitat suitability, changes in sedimentation and stream flow rates which may affect habitat suitability, and increase dispersed recreation/camping that may result in increased removal of FYLF from streams as pets.

The greatest threat to FYLF would most likely be from prescribed fire-related mortality or injury; or post-fire related sediment deposition in response to precipitation events in, or near riparian zones where the outcome of prescribed fire and post-fire effects can be difficult to predict. There is some risk associated with water contamination from unreacted, but mixed plastic spheres used in aerial ignition, but overall the risk is low. Unreacted ethylene glycol would only become problematic if a large number of unreacted plastic spheres entered a waterbody. This scenario is unlikely since an ignition buffer has been established and no ignition within riparian vegetation would occur. Furthermore, plastic spheres do not likely degrade quickly in the environment, and the chemicals contained, if they were to reach a waterbody, would rapidly dilute in flowing water to non-toxic levels.

For the herbicides aminopyralid and glyphosate, based on the hazard quotients for amphibians, FYLFs would not likely be directly affected if water were to become contaminated under an accidental spill or worst case scenario, which is the highest risk characterization considered. For glyphosate, amphibians had a hazard quotient rating of 0.05 suggesting that effects to FYLFs would be low. However, indirect effects to FYLFs from a reduction in invertebrates (prey), algae (forage for tadpoles), and aquatic macrophytes (cover and forage) as noted by the hazard quotients would be likely under an accidental spill scenario. Since this scenario is not part of planned project activities and minimized through the use of Best Management Practices (BMPs), effects to FYLFs from this type of incident are not discussed in detail. Furthermore, in upland environments where applied, glyphosate readily adheres to soil particles and is not likely to enter groundwater or be mobilized after precipitation events based on detection studies performed on the Eldorado National Forest. Overall, risks to FYLFs would be low under proper application of proposed glyphosate formulations which includes the use with low toxicity adjuvants and dyes.

Cumulative Effects

When considered with past, present, and reasonably foreseeable future activities, any cumulative impacts to FYLF or its preferred habitat as a result of implementing Alternative 1 of the Blacksmith ERP are expected to be ‘low’ because no treatments within or adjacent to known occupied or suitable breeding areas, the expected duration of project level effects is short, stream buffer exclusion zones were established to preserve current habitat, the project provides an overall reduction in wildfire risk and provides for the restoration of riparian habitat through prescribed fire.

Overall, the actions of Alternative 1 will ultimately benefit FYLF from a reduction in wildfire risk, and promotion of riparian habitat through prescribed fire. Since response of amphibians depends on the type and magnitude of disturbance, the amount and configuration of remaining habitat, as well as their life-history characteristics project activities may still impact this species even when the outcome is positive.

Alternative 3

Direct and Indirect Effects

Direct and indirect to FYLF for this alternative are expected to be similar to Alternative 1. The difference is in this alternative is that canopy cover in, and adjacent to, riparian conservation areas (RCAs) would not likely experience a reduction in stream shading or an increase in solar radiation, thus any effects (e.g., temperature increase) from a reduction in canopy should not be observable. Under this alternative there would be a substantial reduction in the amount of prescribed burn acres. The amount of reduced prescribed burning under Alternative 3 is less likely to impact FYLF or its habitat than Alternatives 1.

Cumulative Effects

Cumulative Effects would be similar to Alternative 1.

Alternative 4

Direct and Indirect Effects

Although this alternative has a reduction in the amount of mechanical thinning, these areas are largely identified outside of RCAs where FYLF reside, therefore, under this alternative FYLF would experience similar direct and indirect effects as Alternative 1.

Cumulative Effects

Cumulative Effects would be similar to Alternative 1.

Alternative 5

Direct and Indirect Effects

Under this alternative FYLF would experience similar direct and indirect effects as Alternative 1. The additional treatment acres proposed under this alternative to meet the demands of increased pace and scale have largely been identified on ridgetops and would not affect FYLF or its habitat.

Cumulative Effects

Cumulative Effects would be similar to Alternative 1.

Western Pond Turtle

Affected Environment

The western pond turtle (WPT), one of only two species of freshwater turtle native to west coast of the United States, found from sea level to approximately 5,000 ft in elevation; and is uncommon to common throughout California. Western pond turtles are habitat generalists, occurring in a wide

variety of permanent and intermittent aquatic habitats and found in a variety of habitat types including ponds, lakes, streams, irrigation ditches and semi-permanent pools of intermittent streams. Most populations in the Sierra Nevada are restricted to smaller stream habitats.

Existing surveys and sightings

There is only one WPT sighting within the project area boundary. This siting occurred on Wallace Canyon in 1991. Surveys conducted by PCWA for FERC Project #2079 found WPT in the Middle Fork American near Ralston Afterbay and the Horseshoe Bar areas. WPT were not detected within the project area boundary during project level surveys (2011 and 2012) or during other project surveys in the area (Big Grizzly). River and stream habitat suitability was not established by PCWA under the FERC #2079 project but it is reasonable to assume that suitable WPT habitat exists in the same reaches identified as suitable for FYLF since these two species are commonly found occupying the same habitats. For the Blacksmith ERP these areas would include the known areas of the Middle Fork American River, Wallace Canyon and consist of: Long Canyon Creek (including the north and south forks), Rubicon River, South Fork Rubicon River. Habitat mapping identified 650 acres potentially suitable western pond turtle nesting habitat below 5,000 feet and on south facing slopes. Approximately 700 acres of suitable nesting habitat occur within five commercial thinning treatment units where ground disturbing project activities could affect WPT.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Under this alternative, fuels would not be reduced, but would continue to accumulate. The risk for high severity wildfire would remain or increase, with the possibility of stand replacement mortality for much of the project area. No action could lead to a greater risk of erosional effects to aquatic features during periods of increased run-off and snowmelt in the years following a high-severity wildfire than Alternatives 1, 3, 4, and 5.

There would be no direct effects to WPT or its habitat as the result of project activities not being implemented under Alternative 2. However, effects to WPT from potential wildfire under Alternative 2 from the lack of fuels reduction related activities could negatively affect WPT aquatic habitat by an increase in sediment deposition to streams where they occur or suppress recolonization in unoccupied but suitable habitats. Post-wildfire effects could be expected to last 1-15 years depending on burn severity and precipitation events post-fire. High-severity wildfire impacting riparian canopy cover as well as coarse woody debris could render habitat unsuitable further fragmenting WPT populations, but low to moderate wildfire could potentially benefit WPT by increasing solar input to streams that WPT depend upon to bask as well as promote more open (un-forested) areas necessary for use as nesting habitat.

Cumulative Effects

No cumulative effects are expected with this alternative.

Alternative 1

Direct & Indirect Effects

Effects from timber harvest, road related activities, fuels reduction, mastication, prescribed burning, and herbicide application under Alternative 1 are possible since treatments will be occurring partly within, or adjacent to RCAs where WPT usually occupy and use as suitable nesting habitat. WPTs are highly associated with permanent water in ponds, water drafting locations (e.g., waterholes or guzzlers), as well as river and stream channels, however, they will seek out and use upland habitats both within and outside of RCAs to escape peak flow events in winter/early spring as well as dry periods during late summer/early fall. Design features have been established to minimize the effects to WPT. The greatest effects to WPT would most likely be from crushing of individuals during harvest and fuel reduction activities during nesting, incubation, and hatching periods; and during prescribed fire activities.

Potential adverse effects to WPT include mortality or injury to individuals and crushing of nests by equipment and falling timber, harassment by noise and ground vibration that may affect nesting female WPTs or nests removal of downed woody debris for cover habitat of adults and hatchlings, reduction in microclimate structure that may alter habitat suitability of all lifestages, increased public access to riparian areas by OHVs that may degrade habitat quality, and dispersed recreation/camping that may result in removal of WPT from streams as pets.

The effects of herbicides on WPTs is not well understood, but potential for direct effects are believed to be low since their skin is not as permeable as amphibians and they do not fully respire underwater like fish. As a result, risks and effects of herbicides to WPT are not expected under normal application. Using the hazard quotients listed for sensitive and tolerant fish as a baseline, WPT populations could be indirectly affected by either consuming contaminated invertebrates, and macrophytes, or experience indirect effects if a reduction in these prey items as a result of water contamination occurred. Glyphosate readily adheres to soil particles it is not likely to enter groundwater or be mobilized after precipitation events that may affect water quality. Direct contact to eggs at a nesting site, or eggs in contact with contaminated soil could have negative effects under an accidental spill scenario, but this has not been documented.

Individual western pond turtles (usually males) may have large home ranges and may wander within a given watercourse for several kilometers on a regular basis (Reese 1996). Western pond turtle nests have been found as far as 0.25 mi. from water (Reese and Welsh 1997) in open sunny areas on hillslopes, generally with a south to southwest facing aspects . Threats to nests and hatchlings would occur from May through March since the incubation period for western pond turtles is approximately

eight months and may remain in the nest for a week or more. Western pond turtles also move into upland slopes while overwintering. Overwintering movements are poorly understood; however, in Trinity County California, western pond turtles left the study-area river in September and began return movements in February, ending in June; the only lull in activity occurred between December and January (Reese and Welsh 1997). In the Sierra Nevada, the most likely time for western pond turtle overwintering movements is during the fall/late fall and early spring and would represent movements to and from upland overwintering sites. If western pond turtles were overwintering within the proposed project area, crushing of individuals could occur during these timeframes, however the majority of mechanical project activities would be expected to occur within the standard operating period (May – October). Therefore risk to overwintering turtles in the project area is low.

Cumulative Effects

When considered with past, present, and reasonably foreseeable future activities, any cumulative impacts to WPT, its preferred habitat, or nesting habitat as a result of implementing Alternative 1 of the Blacksmith ERP are expected to be 'low' for the following reasons: Short (1-2 yr) duration of project activities, established stream buffer exclusion zones, overall reduction in wildfire risk, and restoration of riparian habitat and nesting habitat through prescribed fire.

Overall, the actions of Alternative 1 will likely benefit WPT from a reduction in wildfire risk and restoration of riparian and nesting habitat through prescribed fire. However, project activities may still impact this species even when the outcome is positive. Response of WPT will likely depend on the type and magnitude of disturbance, the amount and configuration of remaining habitat as well as nesting habitat, and timing of activities as they relate to life-history characteristics.

Alternative 3

Direct and Indirect Effects

The difference in alternatives is the removal of trees with a maximum diameter limit of 12 inches. The effects to WPT from project related activities by removing trees in this size class would be similar to the effects listed for Alternative 1. Canopy cover in, and adjacent to, riparian conservation areas (RCAs) would not likely experience a change in stream shading or solar radiation since 12 inch diameter and smaller trees do not usually contribute to canopy structure, thus any effects (e.g., temperature change) from a reduction in canopy should not be observable in streams. Under this alternative there would be a substantial reduction in the amount of prescribed burn acres. Although the amount of reduced prescribed burning under Alternative 3 is less likely to impact WPT or its habitat than Alternatives 1, 4, and 5 from the potential effects of fire, no benefits to restorative properties of fire would be achieved on a landscape scale and wildfire spread is expected to remain somewhat elevated under this Alternative.

Cumulative Effects

Cumulative effects are expected to be similar to Alternative 1.

Alternative 4

Direct and Indirect Effects

Although this alternative has a noticeable reduction in the amount of mechanical thinning for the benefit of owls, these areas are largely identified outside of RCAs where WPT mostly reside. Therefore, under this alternative WPT would experience similar direct and indirect effects as Alternative 1.

Cumulative Effects

Cumulative effects are expected to be similar to Alternative 1.

Alternative 5

Direct and Indirect Effects

Under this alternative WPT would experience similar direct and indirect effects as Alternative 1. The additional treatment acres proposed under this alternative to meet the demands of increased pace and scale have largely been identified on ridgetops and would only slightly affect WPT or its habitat. It is possible on south facing ridges identified as suitable nesting habitat; habitat could benefit from a reduction in canopy and increased solar input.

Cumulative Effects

Cumulative effects are expected to be similar to Alternative 1.

Terrestrial Wildlife

Direction to maintain the viability of Region 5 endangered, threatened, and sensitive species is provided by the National Forest Management Act, the Code of Federal Regulations (CFR 219.19), the Forest Service Manual, FSM 2672, and the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement (EIS) (USDA Forest Service 2004). Effects to Federally listed Threatened, Endangered or Proposed species, and Region 5 Forest Service designated sensitive terrestrial wildlife species potentially affected by project activities are summarized from Funari and Lipton (2013).

Elderberry Long Horned Beetle

Affected Environment

Habitat for the Valley Elderberry Longhorn Beetle (VELB) is found primarily in moist valley oak woodlands along the margins of rivers and streams in the lower Sacramento River and upper San

Joaquin Valley. They may occur as high as 3,000 feet in elevation from Redding south to Bakersfield, and from east to west across the valley. Streamside woodlands have been largely developed or converted to agricultural uses, eliminating most of the elderberry necessary for the beetles' survival.

Critical habitat has been designated, but none occurs on National Forest System lands. Very little habitat under 3,000 feet in elevation is within the project area and no areas with less than 20% canopy (where elderberry plants would be most likely to occur) were found in GIS query for habitat within units.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

There would be no project-related activities under Alternative 2 therefore there would be no effect to valley elderberry longhorn beetle or its habitat.

Cumulative Effects

Since there are no direct or indirect effects on valley elderberry longhorn beetle, there will be no cumulative effects.

Alternatives 1, 3, 4, and 5

Direct and Indirect Effects

According to the GIS query described above, there are no acres within proposed treatment units that have a likelihood of supporting elderberry plants. Therefore, it is unlikely that elderberry of sufficient size and configuration to support the beetle would be present in proposed project units. However, if an elderberry greater than 1" diameter was present, it would be flagged and avoided during implementation. With this mitigation, there would be no effect on the beetle from the proposed project.

Cumulative Effects

Since there are no direct or indirect effects on valley elderberry longhorn beetle, there will be no cumulative effects.

Sensitive Species

California Spotted Owl

Affected Environment

The Eldorado National Forest (ENF) occurs in the central portion of the species range and represents about 16% of the known population in the Sierra Nevada. California spotted owls have several characteristics that are associated with increased species vulnerability: they have large individual spatial requirements, low population densities, and they are habitat specialists. Spotted owls have high adult survival rates and low reproductive rates—these life history characteristics render spotted owl populations slow to recover from population declines (Verner et al. 1992). California spotted owl demographics and population trends are monitored at four study areas, one of which occurs on the Eldorado National Forest (ELD). Blakesley et al. (2010) analyzed demographic data for the period 1990-2005 and concluded that, with the exception of the Lassen study area, owl populations were stable. Ongoing research, however, provides increasing evidence of population declines on the three studies on National Forest System lands and a stable/increasing population on the National Park Service study area (Conner et al. *in press*, Tempel and Guitierrez 2013). The factors driving these population trends are not known but the increasing evidence of declining population trends of spotted owls on NFS lands in the Sierra Nevada points to the need for a careful approach to management of California spotted owls and their habitat.

On the ENF, spotted owls are known to occur between 2,000 and 7,200 feet in elevation, with most nesting pairs found in the Sierran mixed conifer habitat type. California spotted owl habitat is often subdivided into: nesting habitat, roosting habitat and foraging habitat. Habitats used for nesting and roosting are very similar, and so are combined and described as nesting-roosting habitat. Such areas are used for nesting, roosting, foraging, and dispersal by spotted owls, and are usually forests with more late-seral forest characteristics than "foraging" habitat. Foraging habitat is largely used for foraging and for dispersal but often lacks nest/roost sites or may have insufficient canopy cover to provide nesting/roosting opportunities. These categories are generalizations however nesting-roosting habitat is generally considered to provide all or most habitat requirements, whereas foraging habitats are considered to provide only a subset of the spotted owl's habitat requirements.

Collectively, studies suggest the presence of large trees and high overstory canopy cover (nesting/roosting habitat) are the most important conditions associated with spotted owl occurrence and survival (North 2012, Blakesley 2005, Seamans 2005, Seamans and Gutierrez 2007). High structural diversity, provided through a diversity of tree heights and canopy layers, is thought to benefit spotted owls by contributing to a greater diversity of prey species, providing a variety of perch sites for increased hunting opportunities, and providing variable microclimates for roost sites and increased protection from predators (North et al. 1999, Verner et al. 1992). Suitable habitat for the California

spotted owl consists of mature forested habitats with large trees, dense canopy cover with at least two canopy layers with 70 percent canopy closure preferred for nesting and roosting and greater than 50 percent canopy closure preferred for foraging (USDA Forest Service, 2001; USDA Forest Service, 2004; Verner, McKelvey, Noon, Gutierrez, Gould, & Beck, 1992).

Approximately, 49,447 acres of suitable habitat (measured as 4M, 4D, 5M and 5D CWHR vegetation classes) are present currently within the 1.5 mile analysis area; 72% of the cumulative effects analysis area. About 20% of the cumulative effects analysis area (13, 028 acres) has been altered in the past 30 years from vegetation treatment and timber harvest activities in suitable habitat. Currently 53% of the analysis area (36,419 acres) is classified as unaltered, suitable habitat.

Important characteristics for prey species in stands are the availability of canopy cover, tree height diversity, shrub cover and large snags and down logs, which support the owl's prey base of mainly flying squirrels and woodrats (Laymon, 1988; Lee & Tietje, 2005). The main prey at this elevation for California spotted owls is the northern flying squirrel and woodrats, with woodrats making up proportionally slightly more of the diet (Verner et al. 1992).

Within the 68,426 acre analysis area (49,593 National Forest System land , NFS), California spotted owl PACs cover 8,272 acres of the project area (12% of the total analysis area, 17% of the NFS lands) and HRCAs cover approximately 33,952 acres (50% of the total analysis area or 69% of the NFS lands).

The project area has been surveyed to protocol for spotted owls in 2011 through 2013 following the Pacific Southwest Region's survey protocol (USDA Forest Service 1991). The PACs within the project area have been surveyed almost every year since the early 90's due to the Eldorado Demography Study. There are currently 26 individual territories identified in the Cumulative Effects analysis area. Of the 26 territories, six have had more than 3 reproductive events in the last ten years (PLA0100, PLA0076, PLA0040, PLA0037, PLA0014, and PLA0008); four additional territories have had two or more reproductive events in the last ten years (PLA0113, PLA0050, PLA0038, and PLA0010). These more highly productive owl sites are particularly important for persistence of the local spotted owl population.

Table 11 Status of California Spotted Owl territories within the Blacksmith Project area

PAC	Last year surveyed[1]	Current Status	Occupancy Status [1] (Number of Years - 1986 to 2012; 28 years)						
			Repro	Pair	Single	Unknown[1]	Repro in last 10 yrs (2003-2012)	Pairs in last 10 yrs	Population Contribution Ranking[2]
PLA0008	2012	Reproducing	8	9	6	5	3	6	5
PLA0009	2012	Unoccupied	6	7	6	9	0	0	2

PAC	Last year surveyed[1]	Current Status	Occupancy Status [1] (Number of Years - 1986 to 2012; 28 years)						
PLA0010	2012	Unoccupied	7	12	5	4	2	7	4
PLA0011	2012	Single	1	15	1	11	0	5	3
PLA0012	2012	Unoccupied	7	13	2	6	0	3	2
PLA0013	2012	Unoccupied	7	5	5	11	0	0	1
PLA0014	2012	Reproducing	5	15	5	3	4	10	5
PLA0016	2012	Unoccupied	3	8	10	7	0	0	1
PLA0036	2012	Unoccupied	5	6	7	10	0	0	1
PLA0037	2012	Reproducing	6	14	4	4	3	8	5
PLA0038	2012	Unoccupied	6	8	6	8	2	5	4
PLA0039	2012	Unoccupied	2	10	11	5	1	2	3
PLA0040	2012	Single (barred owl present)	4	8	14	3	3	9	5
PLA0043	2012	Unoccupied	1	4	17	7	0	0	1
PLA0049	2012	Single	3	8	8	9	0	2	2
PLA0050	2012	Pair	7	16	4	1	2	8	4
PLA0052	2012	Unoccupied	4	8	1	19	0	0	1
PLA0066	2012	Unoccupied	0	6	14	8	0	3	2
PLA0076	2012	Pair	9	12	1	6	3	10	5
PLA0080	2012	Pair	5	14	1	8	1	9	3
PLA0098	2012	Pair	4	12	6	6	1	6	3
PLA0099	2012	Pair	4	6	9	9	1	3	3
PLA0100	2012	Reproducing	8	10	4	6	4	9	5
PLA0105	2012	Unoccupied	0	10	6	12	0	2	2
PLA0113	2012	Pair	9	10	4	5	2	9	4
PLA0115	2012	Unoccupied	0	5	6	17	0	0	1

[1]Surveys happened most years for most PACs. Some PACs may have been occupied or reproductive during years no surveys occurred.

[2]Population Contribution Ranking:

5- Sites repro >3+times in last 10 yrs

4- Sites repro >2+times in last 10 yrs

3- Sites that have repro once or had consistent pair(5+yrs) in the last 10 yrs

2- Sites with 1-4 pair in the last 10 years

1-Site that are single or unoccupied in last 10 yrs

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Since there are no project activities proposed under this alternative, there would be no direct or cumulative effects to the spotted owl or its habitat. Existing suitable spotted owl habitat would be maintained, though the risk of future wildfire is higher as accumulated fuels and understory trees would remain. The majority of the PACs in the Blacksmith analysis area have a potential for fire behavior with high flame lengths (>11 feet), higher intensity 100-1,000 btu/ft/sec, and a potential for active crown fire under the 90th percentile weather conditions (Ebert, Fuels Report, 2013). Modeling

of fire spread shows five ignition points could potentially affect eighteen PACs and with the high crown fire predicted in the report would likely cause stand replacement in multiple PACs. Modeling of fire ignitions shows thirteen PACS would potentially be completely consumed by wildfire while one PAC would be partially impacted. The other four PACs would likely have minimal impacts given the modeled scenarios. In other words, there is a likelihood that fire from these ignition points would remove at least one highly reproductive PAC, and impacts from a future wildfire could result in loss of one or more spotted owl pairs from the project area. These indirect effects of no action could contribute to population decline.

The likelihood of a high intensity fire occurring in this particular area and affecting habitat in the near future is highly speculative; therefore, the indirect effects associated with this lack of action are uncertain. In 2005, the U.S. Fish and Wildlife Service indicated that wildlfires pose the largest risk to viability of the California spotted owl and this risk remains highest under Alternative 2, relative to the Action Alternatives. Although the beneficial outcome of reduced wildfire hazard is not achieved, because Alternative 2 involves no actions, the alternative would have no effect on the California spotted owl. Nonetheless, it is important to recognize that the potential for loss of habitat to wildfire is considered to be a substantial threat to California spotted owls.

Cumulative Effects

Alternative 2 involves no actions; the alternative would have no effect on the California spotted owl. Nonetheless, it is important to recognize that the potential for loss of habitat to wildfire is considered to be a substantial threat to California spotted owls.

Alternative 1

Direct & Indirect Effects

DIRECT DISTURBANCE

Surveys and habitat evaluation in the area since the early 1990s have resulted in specific home range core areas (HRCAs) being identified, and further refined as new sighting information is obtained. Given the long history of surveys in the project area, it is not suspected that there are any unknown nest sites or roost sites within the project area. Although individuals likely use portions of the treatment areas for foraging, most of the project activities would occur during the daylight hours, which would avoid disturbance to foraging individuals since owls forage mostly at night. The risk of disturbance to non-nesting individuals from prescribed burning is moderate since prescribed fire use would occur within the 300-acre PACs which include roost sites, and areas in which spotted owls do a substantial amount of foraging. Prescribed fire is likely to cause temporary disturbance to individuals during implementation from people managing the prescribed fire, as well as smoke and other effects similar to natural understory wildfires. These may cause individual roosting owls to awaken or relocate within the stand but this disturbance would be short-term.

Disturbance during the nesting season can result in nest site failure or abandonment. Direct disturbance to nesting owls would be avoided by the implementation of a Limited Operating Period (LOP) for all units within ¼ mile of a known activity center. There are 8 spotted owl activity centers within ¼ mile of treatment units. No road maintenance or construction treatment areas are located in proximity to (within 328 feet of) a known nest site. Therefore, road maintenance or construction would have no negative effects to known owl Activity Centers in the area. No herbicide treatment areas are located within 131 feet of a known nest site. Therefore, herbicide treatments would have no negative disturbance effects to any known owl Activity Centers in the area.

HABITAT ALTERATION

Under Alternative 1, 4,543 acres of suitable spotted owl habitat would be treated. Habitat modification, particularly the reduction of canopy cover and the simplification of stand structure, with proposed treatments could reduce habitat quality even while retaining suitable foraging habitat. Recent research on foraging owls in recent (<10 years) fuels treatments, showed that owls continued to forage in habitat where fuels reduction mechanically removed trees up to 10 inches dbh or used hand thinning and prescribed fire but they avoided using recently treated Defense Fuel Profile Zone (DFPZ) thinning treatments (Gallagher, 2010). Gallagher found that home ranges tend to contain fuels treatments equal to their availability on the landscape, suggesting that owls do not select for or against fuels treatments; however, home range size tended to increase with increasing proportion of treatments. Increases in the size of home range suggest that foraging habitat quality is reduced by fuels treatments, and thus the owls have to forage further to meet their needs; increasing risk of mortality and loss of reproductive success. Thus, although treatments may retain CWHR classes that are identified as suitable habitat (4D, 4M or 5M), the treated stands are assumed to provide less suitable habitat than untreated stands of equal CWHR type due to the removal of habitat attributes, particularly diversity in tree height and woody debris.

Prescriptions for variable density thinning and retention patches used in this Alternative are expected to lessen thinning impacts on canopy cover and understory tree reductions. Studies have not investigated spotted owl use within these types of treatment areas so effects on spotted owl fitness (survival and reproductive success) remain unknown. To the extent that canopy cover and structure resembles the mosaics observed following understory burning, impacts to habitat might be minimal.

Within the El Dorado Study area, Seamans (2005) reported that territory colonization and spotted owl survival probability were positively related to the area of forest with high canopy cover (>70%) dominated by medium (30.4-60.9 cm dbh) and large (>61 cm dbh) trees, within approximately 1,000 acres surrounding the territory center. Because the spotted owl forages in its core foraging area (HRCA) for 60-70% of its foraging needs during the reproductive season (Bingham & Noon, 1997), reductions in foraging habitat quality within HRCAs have more effect upon reproduction and survival than effects upon foraging habitat further away from the nest site.

The project area currently has greater than four >16"dbh snags per acres with an average of 11 per acre sampled within treatment units. Decreases in large downed woody material may decrease but adequate amounts should be available post-treatment. At the elevation range of the project, oaks are considered an important habitat component, both for prey (woodrats) as well as branching structure for roosts, and cavities. Since oak mixed into mature mixed conifer and pine forests is considered excellent owl habitat, perpetuating the oaks within foraging habitat may benefit the spotted owl (Verner, McKelvey, Noon, Gutierrez, Gould, & Beck, 1992; Seamans & Gutierrez, 2007). Habitat modeling of these types of treatments in the SNFPA FEIS (USDA Forest Service, 2004) indicates "trade-offs" for the impacts on spotted owl habitat from fuels treatments. In the short-term (10-20 years), there is a reduction in canopy and stand density, particularly in 4M and 4D stands (Ibid: Chapter 4, pages 267-268). However, in the long-term (20-50 years), the treatments are modeled to result in an increase of 5M or better CWHR types due to release and growth of larger size class trees and reduction in loss from stand replacing fire.

A higher proportion of the large tree stands (CWHR 5M/5D habitat type) in territories is considered important for occupancy within territories (Verner et al 1992, USFS 2001, Seamans and Gutierrez 2007). The Blacksmith CEA area contains 8,451 acres of 5M/5D habitat, about 12% of the CEA area. In Alternative 1, eighty-seven acres of CWHR 5M/5D vegetation types are proposed for commercial thinning. The Sierra Nevada Forest Plan Amendment describes a management intent of avoiding vegetation treatments in CWHR 5D and 5M types (large size class trees and moderate and dense canopy cover) occurring in HRCAs because these habitat types typically correspond to high quality spotted owl nesting and foraging habitats. The silviculture reports states that, "Less than 1% of the treated 5D stands may be expected to be temporarily reduced from 5D to 5M" indicating that treatment intensity are expected to result in minimal changes to canopy cover in these areas (Silviculture Report 2013). Since only 87 acres of 5M/5D habitat would be affected by thinning treatments, and most of this occurs in small patches within larger treatment units, it is reasonable to conclude that the project meets the intent of the Forest Plan to avoid 5M/5D habitat in spotted owl HRCAs.

EFFECTS FROM HERBICIDES

Herbicide treatments are not expected to have a substantial adverse effect on spotted owls or their prey. Carnivorous bird scenarios did not exceed toxicity thresholds for any exposure scenarios; the closest scenarios for spotted owls. Sub-lethal effects to spotted owl prey could negatively impact owl reproduction or survival, however, the threshold of concern for small mammals that eat insects was not exceeded with the proposed application rate of any of the herbicides.

Mastication and some herbicide treatments are occurring in plantations which may provide habitat for spotted owl prey, and occasionally receive use by foraging spotted owls, at least along the edges of plantation units. Prey species would most likely decrease within the mastication, and plantation units,

as well thinned and tractor piling units for the first 3-5 years as prey species, such as woodrats, are positively related to shrub cover and woody debris (Converse et al 2006, Inns et al 2007, USDA Forest Service 2006). Retention areas, brush pockets and downed woody material left through jackpot piling will reduce some of the negative impacts to mammalian prey species and possibly avian prey species. The mastication and follow-up herbicide treatment of shrubs within 242 acres of plantations, and up to 60 acres of herbicide treatments in 3 planted units, may reduce spotted owl prey in these units, but affected areas are limited and do not represent a large, or predicted heavy use, portion of any spotted owl territory.

EFFECTS ON MANAGEMENT AREAS (LAND ALLOCATIONS)

PACs

Thirteen PACs would be treated with prescribed fire only, with felling and/or limbing of trees generally less than 6 inches dbh, raking, and fire line constructed to control the spread and intensity of the prescribed fire. There are 1,146 acres of prescribed fire units within PACs which would directly alter habitat within the PACs. In addition to the burning, 1 acre would be masticated and 4 acres would be hand thinned. Observable negative effects from these treatments are not expected. All of these acres would be expected to remain suitable, but would see some reductions in large tree number, canopy closure, and down logs. It is expected that all acres would remain at moderate habitat capability as a minimum, and is estimated that 50% or more may retain high capability habitat where tree mortality is lowest, and canopy closure is least affected. A 5% canopy cover reduction is expected from prescribed burning. No loss in High Capability Habitat should result from Alternative 1. Prescribed fire of low-moderate burn intensity is not expected to affect persistence of owls at known owl sites and is believed to maintain spotted owl habitat overall, (Roberts et al, 2010; Franklin et al, 2000, Gallagher, 2010).

The majority of the PACs in the Blacksmith analysis area have potential for fire behavior with high flame lengths (>11 feet) high intensity (100-1000+ btu/ft./sec) and potential for active crown fire under the 90th percentile weather conditions as discussed in the Fuels Report (Ebert, 2013). Modeling of fire spread shows that 11 of 19 PACs impacted by modeled fire start locations would have the amount of PAC potentially affected by high intensity wildfire reduced with Alternative 1. Modeled fire simulations reduced fire acreage consumed in five PACs; however, 9 PACs would still be completely burned through by a potential wildfire. According to the Fuels Report, the reduction in flame length and intensity will reduce within PACs, allowing a more low to moderate fire to spread.

HRCAs

Twenty-three percent (5,984 acres) of suitable owl habitat in HRCAs would be treated across 26 HRCAs. HRCAs cover 50% of the analysis area, 69% of NFS lands, and about 86% of treatments would be within HRCAs. Alternative 1 would affect up to 35% of the PAC/HRCA area of an individual owl site. This alternative would result in a lowering of habitat quality due to canopy closure

reduction effects, removal of ladder structure, and the removal of hazard trees, as described previously for suitable habitat in general.

Additionally, approximately 2,888 acres of twenty-four HRCAs would be directly affected by proposed prescribed burning. It is expected that all acres would remain at moderate habitat capability as a minimum, and foraging habitat for owls would remain good quality. Fourteen acres of High Capability habitat at about 70% canopy cover could potentially be reduced to Moderate Capability Habitat through prescribed burning; however, prescribed fire only treatments are not expected to adversely affect owl occupancy nor fitness.

While studies provide general descriptions of spotted owl nesting and foraging habitat use, the amounts and spatial configuration of habitat within home ranges that is necessary to provide a high probability of occupancy and high fitness (measured by spotted owl survival and reproduction) has not been established. Research conducted on the Eldorado demographic study area, and reported by Seamans 2005 and Seamans and Gutierrez 2007, suggests that California spotted owl territories with greater amounts of mature, dense conifer forest (MCF) (defined as average tree size greater than 12 in dbh, and canopy cover $\geq$ 70 percent) have a higher probability of being colonized and a lower probability of becoming unoccupied. Seamans and Gutierrez (2007) also found that alteration of more than 50 acres of this habitat in spotted owl territories increased the likelihood of territory extinction and that territory extinction probability increased steeply in sites with <370 acres of this habitat available. (Note that these studies used discreet canopy cover categories of $\geq$ 70% and 30 -69 %, and for this reason the actual threshold for canopy cover that contributes to or detracts from territory occupancy and survivorship remains unknown).

Seamans (2005) reported that the probability of territory extinction on the ENF demographic study area approached zero as the area with mature, dense forest (average tree size $\geq$ 12 inches dbh and canopy cover $\geq$70%) approached 617 acres within a 400 ha (approximately 1,000 acre) circular area surrounding the territory center. The results of Seamans (2005) suggest that where approximately 600 acres of MCF is maintained surrounding the spotted owl activity center (preferably within 0.7 miles of the activity center), thinning of additional dense canopied habitat is unlikely to increase probability of a decline in territory occupancy.

Alternative 1 would reduce canopy cover and structure through thinning treatments in 794 acres of mature, dense conifer forest within HRCAs of 24 spotted owl sites. Sixteen spotted owl territories would be affected by thinning treatments within the circular core area, and an additional eight sites would be affected by treatments outside the circular core area but within the more dispersed HRCA (which is mapped entirely on NFS land). Of these 24 affected owl sites, treatments in the circular core area would result in 13 territories with less than 600 acres of mature dense conifer habitat on NFS land within the circular core; treatments within the HRCA would affect two additional territories and result in seven HRCAs with less than 600 acres of MCF habitat. Information in Seamans (2005) and

Seamans and Gutierrez (2007) suggests that Alternative 1 treatments may increase the probability of breeding dispersal and decrease the probability of colonization for these spotted owl territories.

The circular core areas include private lands and are drawn irrespective of ridge, drainages and areas that may not be highly utilized by the owls due to topography. Habitat composition is evaluated in this circular core area since it is consistent with the research conducted in the Eldorado demographic study area. It is plausible, however, that the more dispersed 1,000 acre HRCA, which is mapped considering habitat quality and topography, (because biologists map HRCAs) is more consistent with how owls utilize the landscape. Seven spotted owl territories would have less than 600 acres of MCF habitat remaining on NFS lands in both the circular core area and within the more dispersed 1,000 acre HRCA area, following Alternative 1 treatments (PLA0008, PLA0012, PLA0016, PLA0040, PLA0076, PLA0080, and PLA0098). Alternative 1 treatments would increase the probability of territory extinction for these sites and reduce the likelihood of colonization, and most notably for PLA0008, PLA0012, and PLA0016 since these sites would also have less than 370 acres of MCF habitat within the circular core area.

Fifteen spotted owl territories in the analysis area have reproduced or had consistent pairs within the last ten years; these sites are probably important contributors to the population. Reduction of MCF habitat within the circular core area would impact 12 of these productive sites and reduction of MCF habitat in the HRCA would impact five of these sites. An increased risk of dispersal probability from these spotted owl territories would have greater potential to influence population trends. Alternative 1 would alter more than 20 percent of the available MCF habitat within the circular core area or the HRCA of PLA0008, PLA0014, PLA0037 and PLA0080, which have consistently supported pairs and include some of the more highly productive owl sites in the project area. The magnitude of habitat alteration surrounding these 4 owl sites increases uncertainties and risks to the local spotted owl population. Because of its low initial amount of MCF habitat in proximity to the activity center, PLA0008, a highly productive territory, would be particularly at risk for loss of occupancy following Alternative 1 treatments.

REDUCED FIRE HAZARD AND RISK

Modeling of fire spread following implementation of Alternative 1 shows reduced wildfire effects to spotted owl PACs in comparison to the No Action Alternative. Modeled fire simulations show reduced acreage burned in five of the 14 PACs that were estimated to be largely (>75% of PAC acreage) or partially (>25% of PAC acreage) affected by wildfire under the No Action Alternative. In addition to the results of modeled fire simulations, the fuels report describes that Alternative 1 treatments would reduce flame length and fire intensity in 11 PACs, in the event of a wildfire. The reduced acreage burned in 5 PACs, and the lower intensity of fire effects within 11 PACs, would increase the probability of these PACs remaining occupied under the scenario of a future high intensity wildfire in the Blacksmith project area.

Cumulative Effects

With this project 37% of owl habitat in the analysis area will have been cumulatively impacted including private lands treatment; leaving 63% of suitable habitat unaltered in the last 30 years (26% of the analysis area has been treated in the last 30 years over all land ownerships). This is consistent within the modeled SNFPA percentage of landscape level treatment (20-30%).

The SNFPA (2004) determined that fuels reduction thinning treatments on 20 to 30 percent of the landscape were generally unlikely to have a significant adverse effect on spotted owls, although it also recognized that local factors need to be considered during individual project analysis. Biologists on this forest have observed loss in occupancy when 40% cumulative impacts were observed in HRCAs (Ilse, 2010). Owls whose home ranges have been substantially negatively altered are likely to enlarge their home range, shift habitat use, utilizing the suitable port ions of their home range heavily and/or shifting their home range to encompass more suitable habitat (Gallagher, 2010). Thus for owl HRCAs and home ranges that have had a large amount of past habitat modification, the residual unmodified habitat may be heavily utilized and thus have greater value for spotted owls.

Four of the twenty six analysis area HRCAs would sustain more than 40% high or moderate intensity habitat alteration in the last 30 years with Alternative 1 included (PLA0012, PLA0014, PLA0040, and PLA0080). Cumulative impacts to two of these sites, PLA0014 and PLA040, which have remained highly reproductive over the last 10 years, would be of particular concern.

Table 12 Summary of Findings for California Spotted Owl

Factor	Number of CSO Territories	Implications
Affected by harvest prescriptions that will reduce habitat quality	24	About 12% of ENF spotted owl sites (PACs)
Treatment units in Circular Core area: Less than 600 acres of MCF habitat remaining in circular core area following treatments	14	Increased probability of territory abandonment following implementation (assumes habitat on surrounding private timberlands is unavailable since its retention is uncertain) (All territories except PLA0036, PLA0038, PLA0039, PLA0052, PLA0066, and PLA0099)
Treatment Units in HRCA: Less than 600 acres of MCF habitat remaining in HRCA and circular core area following treatments	7	Increased probability of territory abandonment following implementation (PLA0008, PLA0012, PLA0016, PLA0040, PLA0076, PLA0080, and PLA0098)
Less than 600 acres of MCF in HRCA and less than 370 acres of MCF habitat on NFS lands in circular core area following treatments	3	Probability of territory abandonment following treatments most substantial for these sites (PLA008, PLA0112, and PLA0116 -PLA0008 has been highly productive)
Treatments alter > 20% of available MCF habitat in the HRCA or circular core area	4	Degree of habitat alteration and the associated uncertainty of effects is high for these sites. (PLA0008, PLA0014, PLA0037, PLA0080, , and PLA0105). Includes 3 of the most productive territories.

Factor	Number of CSO Territories	Implications
Number of territories with consistent pairs that would have less than 600 acres of MCF habitat remaining in the circular core or HRCA area.	12	Abandonment of these sites would have greatest potential for contributing to population declines (PLA0008, PLA0010, PLA0011, PLA0014, PLA0037, PLA038, PLA0040, PLA0050, PLA0076, PLA0080, PLA0098, PLA0099)
Cumulative effects from the Alternative combined with past vegetation treatments exceeds 40% of the HRCA	4	Increased risk of site abandonment based on past observations on the ENF—three affected sites are high population contributors (PLA0012, PLA0014, PLA0040, and PLA0080)
Reduced risk of habitat loss due to wildfire in the PAC (as compared to No Action)	11	Benefits associated with Increased likelihood of habitat retention and spotted owl occupancy in the long-term (PLA0037, PLA0049, PLA0050, PLA0105, and PLA0115 modeled to have reduced acreage affected by wildfire)

Considering the number of spotted owl sites affected by treatments, the extent of habitat alteration in circular core areas and HRCAs, and the uncertainties surrounding spotted owl response to treatments, Alternative 1 is likely to result in a loss of occupancy within one or more spotted owl sites. The increased risk of "territory extinction" is significant since it would involve 12 territories that have consistently supported spotted owl pairs and the probability of territory abandonment would increase sharply within one highly productive territory. Current information from the demographic study areas suggests that the California spotted owl population may be declining within the project area and within the Sierra Nevada region as a whole (Conner et al. 2013, Tempel and Gutierrez 2013).

Alternative 3

Direct and Indirect Effects

Direct and indirect effects at the stand scale would differ from Alternative 1 in the following manner:
1) Thinning and removal of small trees would not substantially alter the vertical structure most important to spotted owls, in higher diameter forested stands. As compared to Alternative 1, the residual stand structure would provide better habitat quality immediately after the project is implemented and would be unlikely to result in a change in foraging use, based on findings of Gallagher (2010).
2) When compared with Alternative 1, less suitable habitat acreage is proposed to be prescribed burned (239 acres) and thinned (1,906 acres) throughout the project area. Overall, 2,355 less habitat acres will be treated with Alternative 3 than Alternative 1. With this reduction in area, slightly less nesting/roosting habitat (CWHR 5M/5D) would be treated through mechanical treatments. About 277 acres of 5D/5M would be treated with Alternative 3; 176 fewer acres than Alternative 1, and the quality of this habitat would be minimally altered by treatments.

Unlike Alternative 1, the direct and indirect effects to habitat at the stand scale will be minor, and will not affect the amount or distribution of quality habitat within spotted owl HRCAs. Alternative 3 is

therefore unlikely to increase the probability of territory abandonment or reduce spotted owl survivorship in individual territories.

REDUCED FIRE HAZARD AND RISK

Modeling of fire spread with implementation of Alternative 3 shows reductions in flame lengths and intensities that will reduce fire spread and risk of crown fire outside and within PACs; but not as much as Alternative 1 (Ebert, Fuels Report 2013). Modeling of fire spread shows reduced acreage affected within one spotted owl PAC in comparison to the No Action Alternative. In addition to modeled fire simulations, the fuels report describes that in the event of a future wildfire; Alternative 3 treatments would reduce flame length and fire intensity in 9 PACs, but not to the degree of Alternative 1 treatments. The reduced fire spread in one PAC, and the lower intensity of fire effects within 9 PACs, would increase the probability of a greater number of PACs remaining occupied under the scenario of a future high intensity wildfire in the Blacksmith project area.

Cumulative Effects

Overall cumulative effects to spotted owl PACs, HRCAs, and home ranges would be of low intensity, reducing the likelihood of breeding dispersal compared to Alternative 1.

Because habitat changes within spotted owl territories would not result in predicted impacts, cumulative effects are minor and this Alternative would not add a declining population trend on the Forest or in the Sierra Nevada Region.

Table 13 Summary of Findings for California Spotted Owl

Factor	Number of CSO Territories	Implications
Affected by harvest prescriptions that will reduce habitat quality	0	
Treatment units in Circular Core area: Less than 600 acres of MCF habitat remaining in circular core area following treatments	0	
Treatment Units in HRCA: Less than 600 acres of MCF habitat remaining in HRCA and circular core area following treatments	0	
Less than 600 acres of MCF in HRCA and less than 370 acres of MCF habitat on NFS lands in circular core area following treatments	0	Probability of territory abandonment following treatments most substantial for these sites
Treatments alter > 20% of available MCF habitat in the HRCA or circular core area	0	
Number of affected territories with consistent pairs that would have less than 600 acres of MCF habitat remaining in the circular core or HRCA area following treatments.	0	
Cumulative effects from the Alternative combined with past vegetation treatments exceeds 40% of the HRCA	0	

Factor	Number of CSO Territories	Implications
Reduced risk of habitat loss due to wildfire in the PAC (as compared to No Action)	9	Benefits associated with Increased likelihood of habitat retention and spotted owl occupancy in the long-term. (PLA0105 modeled to have reduced acreage affected by wildfire).

Alternative 4

Direct and Indirect Effects

Direct and indirect effects would be same as Alternative 1, except what is described in the following discussion.

HABITAT ALTERATION

When compared with Alternative 1, less suitable habitat is proposed to be prescribed burned (56 acres) or thinned (471 acres) throughout the project area. Overall, 527 less habitat acres will be treated with Alternative 4 than Alternative 1. Slightly less 5M/5D habitat would be treated through mechanical treatments as Alternative 4 would affect 34 fewer acres of this high quality habitat type.

MANAGEMENT AREAS (LAND ALLOCATIONS)

HRCA

Three hundred sixty-four acres of canopy cover reducing treatments in Mature Conifer Forest habitat(MCF within 400 ha circular core areas and HRCAs, were removed from Alternative 1 treatments to lower the risk of reducing occupancy of existing spotted owl sites. Canopy reducing treatment units that affected territories with limited amounts of MCF habitat, were reviewed and remained in Alternative 4 where removal of larger trees and associated cover was necessary to strategically alter fire behavior and change modeled fire outcomes.

Alternative 4 would reduce canopy cover and structure through thinning treatments in 429 acres of mature, dense conifer forest (MCF) within HRCAs of 20 spotted owl sites. Twelve spotted owl territories (4 fewer than Alternative 1) would be affected by thinning treatments within the circular core area, and an additional eight sites would be affected by treatments outside the circular core area but within the more dispersed HRCA. Of these 20 affected owl sites, treatments in the circular core area would result in eight territories with less than 600 acres of mature dense conifer habitat on NFS lands within the circular core; treatments in the HRCA would affect eight additional territories but result in only one HRCA with less than 600 acres of MCF habitat. PLA0098 would have less than 600 acres of MCF habitat remaining on NFS lands in both the circular core area and within the more dispersed 1,000 acre HRCA area, following Alternative 4 treatments but effects are unlikely since such a minimal amount of MCF habitat (6 acres) is being treated in the HRCA of this site.

The amount of canopy reducing treatment occurring in MCF habitat in the circular core areas of owl sites is reduced from an average of 44 acres/core area to 23 acres/core area, and in the HRCA from an average of 105 acres/HRCA to 59 acres /HRCA, when comparing Alternative 1 and Alternative 4.

Of the fifteen spotted owl territories in the analysis area that have reproduced or had consistent pairs within the last ten years. Reduction of core area MCF habitat would impact three of these sites and reduction of MCF habitat in the HRCA would impact one site. An increased risk of dispersal probability from these four spotted owl territories would have greater potential to influence population trends. Three of the affected territories, PLA0010, PLA0014, and PLA0080 would retain more than 600 acres of MCF habitat in the HRCA (though not in the circular core area) and the fourth affected site, PLA0098, would have only 6 acres of treatment in MCF habitat in its HRCA.

REDUCTION IN FIRE HAZARD AND RISK

Benefits of Alternative 4 for reducing fire hazard and risk for owl territories are the same as described for Alternative 1.

Cumulative Effects

Alternative 4 would treat 585 less acres of suitable habitat in the analysis area. Two percent less of the landscape would be treated under Alternative 4 when compared to Alternative 1. Five HRCAs that are currently near or over 40% cumulative habitat alteration (PLA0012, PLA0040, PLA0113PLA0043, PLA0080), would have little to no impact from Alternative 4 as compared to Alternative 1. Cumulative effects within the HRCA of PLA0080 would increase by only 3 percent (commercial thin) and the site would retain > 600 acres of MCF habitat, in comparison to Alternative 1 in which HRCA habitat alteration would increase by another 14%.

Alternative 4 treatments were designed to minimize impacts likely to diminish a home range's capability to support spotted owl occupancy, survival and reproduction, while reducing fire risk. Alternative 4 does increase the probability of eight spotted owl PACs becoming or remaining unoccupied, and four of these sites have consistently supported spotted owls pairs. The HRCA for each of these PACs would continue to provide more than 600 acres of dense, mature conifer (MCF) habitat following Alternative 4 treatments, however, and, unlike Alternative 1, treatments would not reduce this habitat below 370 acres within the 400 ha circular core area of any spotted owl site. Because Alternative 4 treatments would affect fewer acres in proximity to spotted owl activity centers and within HRCAs overall, the magnitude of effects is lower than described for Alternative 1, Alternative 4 is less likely to result in a loss of spotted owl territories from the project area. Simultaneously, the long-term benefits of fire hazard reduction are similar to Alternative 1: in the event of a future wildfire, Alternative 4 is modeled to reduce the risk of wildfire spread into 5 PACs and flame length and fire intensity would be expected to be reduced in 11 PACs.

Table 14 Summary of Findings for California Spotted Owl

Factor	Number of CSO Territories	Implications
Affected by harvest prescriptions that will reduce habitat quality	20	About 10% of ENF spotted owl sites (PACs)
Treatment units in Circular Core area: Less than 600 acres of MCF habitat remaining in circular core area following treatments	8	Increased probability of territory abandonment following implementation (assumes habitat on surrounding private timberlands is unavailable since its retention is uncertain) (PLA0009. PLA0010, PLA0013, PLA0014, PLA0080, PLA0099, PLA0105, PLA0115) (note there is < 10 acres MCF habitat affected in 3 of these territories)
Treatment Units in HRCA: Less than 600 acres of MCF habitat remaining in HRCA and circular core area following treatments	1	Effects are unlikely since only 6 acres MCF habitat is being treated in the HRCA of this site (PLA0098)
Less than 600 acres of MCF in HRCA and less than 370 acres of MCF habitat on NFS lands in circular core area following treatments	0	Probability of territory abandonment following treatments most substantial for these sites
Treatments alter > 20% of available MCF habitat in the HRCA or circular core area	0	
Number of territories with consistent pairs that would have less than 600 acres of MCF habitat remaining in the circular core or HRCA area.	4	Abandonment of these sites would have greatest potential for contributing to population declines (PLA0010, PLA0014, PLA0080, and PLA0098)
Cumulative effects from the Alternative combined with past vegetation treatments exceeds 40% of the HRCA	2	Increased risk of site abandonment based on past observations on the ENF (PLA0012 and PLA0080)
Reduced risk of habitat loss due to wildfire in the PAC (as compared to No Action)	11	Benefits associated with Increased likelihood of habitat retention and spotted owl occupancy in the long-term (PLA0037, PLA0049, PLA0050, PLA0105, and PLA0115 modeled to have reduced acreage affected by wildfire)

Alternative 5

Direct and Indirect Effects

HABITAT ALTERATION

Direct and indirect effects at the stand level would exceed those described for Alternative 1 in that 168 more acres would be treated with mechanical thinning and follow-up treatments. In addition, Alternative 5 prescriptions would remove more vertical and horizontal structure. Treatments are modeled to result in an average canopy cover of 48% in treated stands, compared to an average canopy cover of 59% under Alternative 1. Forty three additional acres of nesting habitat would be impacted and likely degraded to foraging habitat. Suitable habitat would be removed where harvest prescription would reduce canopy cover below 40% in some stands. Thus, both the quality and the amount of spotted owl habitat would decrease over the landscape under Alternative 5.

In addition, about 79 more acres of 5M/5D habitat within HRCAs would be included in thinning treatments as compared to Alternative 1 (253 acres). This difference affects PLA0098, PLA0013 and PLA0012. Approximately, 31% of 5D/5M in PLA0098 and 27% of 5D/5M in PLA0013 would be affected through Alternative 5 prescriptions. This would reduce the availability of quality nesting/roosting habitat in these HRCAs with potentially to affect fitness of these sites.

MANAGEMENT AREAS (LAND ALLOCATIONS)

PACs

The effects of Alternative 5 within PACs differ from Alternative 1 in that 81 acres of Moderate Quality habitat within the PAC of PLA0115 would be treated with commercial thinning. PLA0115 has been unoccupied over the past 10 years. Since the local owl population does not appear to be increasing, PLA00115 is unlikely to become occupied and effects of Alternative 5 would be unlikely to affect spotted owl use of this PAC.

HRCAs

Approximately 3,333 acres of HRCA will be impacted through mechanical treatment in Alternative 5; 265 acres more than Alternative 1. Increases in HRCA acreage impacts from the PA occur within seven territories: PLA0009, PLA0012, PLA0013, PLA0014, PLA0098, PLA0099, PLA0115. The highest impact is to PLA0115 with a 10% increase in the HRCA area treated. Prescriptions would remove more vertical and horizontal structure and, unlike Alternative 1, would not necessarily maintain the cover and patchy structure thought to be important for quality foraging habitat. Therefore, habitat alteration within HRCAs is more likely to result in a loss in occupancy or breeding dispersal than the other action alternatives. As described for Alternative 1, 12 spotted owl sites which have consistently supported pairs would have MCF habitat reduced in the circular core area or within the HRCA through thinning.

PLA0098 has consistently supported owl pairs and the reduction in habitat acres (as compared to Alternative 1) further increases the breeding dispersal and extinction probability for this productive site.

REDUCTION IN FIRE HAZARD AND RISK

Effects (benefits) of Alternative 5 are the same as described for Alternative 1.

Cumulative Effects

Alternative 5 would treat 585 more acres of suitable habitat in the analysis area. Suitable habitat acres are likely to be reduced under this alternative due to the reduction in stands less than 40% canopy cover. The number of HRCA territories with over 40% cumulative impacts increases from 5 to 6 with comparison to the PA; PLA0115 is added. PLA0115 territory is not really at risk of loss of occupancy because it has been unoccupied for the last ten years.

Table 15 Summary of Findings for California Spotted Owl

Factor	Number of CSO Territories	Implications
Affected by harvest prescriptions that will reduce habitat quality	24	About 12% of ENF spotted owl sites (PACs)
Treatment units in Circular Core area: Less than 600 acres of MCF habitat remaining in circular core area following treatments	14	Increased probability of territory abandonment following implementation (assumes habitat on surrounding private timberlands is unavailable since its retention is uncertain)
Treatment Units in HRCA: Less than 600 acres of MCF habitat remaining in HRCA and circular core area following treatments	7	Increased probability of territory abandonment following implementation (PLA0008, PLA0012, PLA0016, PLA0040, PLA0076, PLA0080, and PLA0098)
Less than 600 acres of MCF in HRCA and less than 370 acres of MCF habitat on NFS lands in circular core area following treatments	3	Probability of territory abandonment following treatments most substantial for these sites (PLA008, PLA0112, and PLA0116 -PLA0008 has been highly productive)
Treatments alter > 20% of available MCF habitat in the HRCA or circular core area	4	Degree of habitat alteration and the associated uncertainty of effects is high for these sites. (PLA0008, PLA0014, PLA0037, PLA0080, and PLA0105). Includes 3 of the most productive territories.
Number of territories with consistent pairs that would have less than 600 acres of MCF habitat remaining in the circular core or HRCA area.	12	Abandonment of these sites would have greatest potential for contributing to population declines (PLA0008, PLA0010, PLA0011, PLA0014, PLA0037, PLA038, PLA0040, PLA0050, PLA0076, PLA0080, PLA0098, PLA0099))
Cumulative effects from the Alternative combined with past vegetation treatments exceeds 40% of the HRCA	4	Increased risk of site abandonment based on past observations on the ENF—three affected sites are high population contributors (PLA0012, PLA0014, PLA0040, and PLA0080)
Reduced risk of habitat loss due to wildfire in the PAC (as compared to No Action)	11	Benefits associated with Increased likelihood of habitat retention and spotted owl occupancy in the long-term (PLA0037, PLA0049, PLA0050, PLA0105, and PLA0115 modeled to have reduced acreage affected by wildfire)

Northern Goshawk

Affected Environment

It is estimated that there are around 600 known goshawk territories on National Forest system lands in the Sierra Nevada, with about 70 territories occurring on the ENF. Territories appear to be well distributed across the Sierra Nevada, however occupancy of many territories is unknown and population trend is unknown due to a lack of demographic studies for this species. On the ENF known goshawk sites appear to be fairly well distributed across the forest, between 4,000 and 7,000 feet in elevation (USDA 2001).

Suitable habitat for the northern goshawk consists of mature forested habitats with large trees, dense canopy cover with at least two canopy layers, and abundant snags and down logs (USDA Forest Service 2001 and 2004). Northern goshawk habitat is defined on the Eldorado National Forest using

the California Wildlife Habitat Relationships Models (CWHR) canopy and size classes. In general, foraging habitat is defined as canopy cover > 40% and trees greater than 12 inches dbh (CWHR 4M, 4D, 5M, 5D), nesting habitat is defined as canopy cover >60% and trees greater than 24 inches dbh (CWHR 5M, 5D).

The northern goshawk primarily preys upon passerine birds, particularly favoring Stellar's Jays and woodpeckers, as well as squirrels and chipmunks. Passerine birds are common throughout the open and dense canopied forest. It is believed that mature forest with open understory allows for northern goshawks to most efficiently hunt prey, due to maneuverability between trees, yet with at least 40% overstory canopy cover and large trees (Beier & Drennan, 1997; La Sorte et al., 2004). Goshawk reproduction is known to be linked to habitat structure, prey density, and prey availability due to forest structure. Low levels of supplemental feedings to goshawks were found to make the difference in successful fledging of goshawk young in poorer habitats (Bytholm & Kekkonen, 2008). Because goshawks select foraging sites based upon habitat structure, goshawks would forage in suitable habitat even when prey densities are lower than other habitats (Beier & Drennan, 1997). Thus goshawks would likely continue to forage where they have foraged in the near past.

Goshawk nesting habitat requirements are thought to be more specific than foraging requirements, as goshawks are generally believed to be foraging generalists (Federal Register, 1998). Northern goshawk protected activity centers (PAC) have been delineated around territorial goshawk activity centers. Habitat patches surrounding nest locations are known to range from 25 to 250 acres in size, therefore, the SNFPA (USDA Forest Service 2004) required 200 acre protected activity centers (PAC) have been delineated around breeding sites.

Surveys

Most recent surveys were conducted in 2012 and included PACs and all suitable habitats within the project area and within a half mile of proposed units. Northern goshawks tend to be secretive and subsequently more difficult to find, thus there is some potential that there could be unknown nest sites within the project area that were not detected during protocol surveys. In addition, goshawks move nest sites frequently and generally have multiple nests sites that they use in an alternating fashion within their territory (USDA Forest Service 2006).

Table 16 Most recent and best status for goshawk territories within the cumulative effects area

PAC	Best Status/Year	Last Status/Year	Last Surveyed
G04-05	**Nest 2007**	**2012**	**2012**
G04-08	Nest 2012	2012	2012
G05-02	**Nest 2011**	**2008**	**2008**
G05-04	**Nest 2012**	**2012**	**2012**
G05-05	**Nest 2011**	**2012**	**2012**
G06-01	**Nest 2010**	**2012**	**2012**

PAC	Best Status/Year	Last Status/Year	Last Surveyed
G06-02	**Nest 2007**	**2012**	**2012**
G10-01	**Nest 2011**	**2012**	**2012**
G10-02	Nest 2008	2012	2012
G10-03	**Nest 1994**	**2012**	**2012**
G10-04	**Nest 2012**	**2012**	**2012**
G10-05	Nest 2008	2008	2008
G10-06	Nest 2007	2008	2008
G10-07	Nest 2008	2008	2008
G10-09	Nest 2008	2012	2012
G10-10	Pair 2008	2008	2008
G10-11	**Nest 2012**	**2012**	**2012**
G11-07	**Nest 1998**	**2012**	**2012**

*__Bold__ faced PACs are within project area. CEA area is 1.5 miles from project boundary.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Since there are no project activities proposed under this alternative, there would be no direct or cumulative effects to the northern goshawk or its habitat. Indirect effects may result due to future fire risk and habitat loss as a result. Suitable goshawk habitat in and adjacent to the project area could be threatened since the risk of catastrophic wildfire would not be reduced.

Since goshawks generally forage below the canopy, dense understories reduce the suitability of forested stands for foraging. Dense understory conditions would continue and increase under Alternative 2 which might increase hunting time and decrease number of prey captured. Alternative 2 would also allow fire risk to continue to increase, with the potential for large, severe stand altering fires that would remove habitat with the potential to result in loss of one or more nesting pairs of goshawks from the project area.

Cumulative Effects

No cumulative effects are expected with this alternative.

Alternative 1

Direct & Indirect Effects

Disturbance during the nesting season can result in nest site failure or abandonment. There are six goshawk PACs located within a quarter mile of the proposed units, PACs G05-02, G05-04, G06-02, G10-01, G10-11, and G11-07 and all would have LOPs around their Activity Centers. The LOP for all activities should protect nesting goshawks from disturbance during the breeding season.

Four PACs will have 234 acres of prescribed burning treatments. Prescribed burning in PACs has the potential to disturb nesting goshawks and cause a loss of reproductive success for the year of burning. The SNFPA allows a breeding season LOP to be waived, where necessary to allow for early season prescribed fire use in up to 5 percent of goshawk PACs per year. The four PACs that would be affected by prescribed fire use would not exceed this limitation. Additionally, prescribed burning would help protect goshawk PAC habitat from stand replacing fires. Prescribed fire treatments in the PACs would be designed to have an average flame length less than four feet (Standard and Guideline #74) which would maintain large trees and most overstory canopy cover while opening the lower understory from dense fuels. It is therefore unlikely that prescribed burning would adversely affect nesting habitat and it may improve nest stands for foraging.

The proposed treatment units contain about 277 acres of high quality (nesting and foraging) habitat and 4,266 acres of moderate quality (nesting and foraging) for goshawk. The effects on goshawk habitat on the west slope of the Sierra Nevada from treatments following the SNFPA standards and guidelines are analyzed in the SNFPA FEIS and FSEIS and that analysis is incorporated by reference (Chapter 3, part 4.4, pgs 113-142: USDA Forest Service 2001, Chapter 4, pgs 280-286: USDA Forest Service 2004). Protection of habitat around known nest locations (PACs), and Standards and Guidelines requiring retention of large trees, 40 to 50 percent canopy cover in treated stands, and snags, should maintain habitat with capability to support goshawks.

Higher canopy cover would be maintained within the treatment units in patches such as in retention areas and in prescription "skips" that should maintain some complex structural diversity within treated stands. This and the retention of CWHR 5D stands within goshawk and spotted owl PACs and HRCAs, will maintain a diversity of habitats and dense patches on the landscape, that are likely to be important for nesting and foraging goshawks.

All treatments have the potential to temporarily displace goshawk prey species, but effects are likely greatest in mechanical thinning units with follow-up fuels treatments. Reducing shrub and understory cover in goshawk foraging habitat within units could alter prey composition and decrease abundance for a five to ten year period after initial treatments. As foraging generalists, goshawks may be able to adapt to changes in prey composition; some research has found that rodent biomass does not change following thinning treatments whereas species composition might. Design criteria should maintain adequate downed woody material and brushy understory to reduce negative impacts to prey from treatments.

In the long-term, foraging opportunities for goshawk may be enhanced in these areas by opening the understory, which allows for greater mobility beneath the canopy and also can increase prey diversity once shrubs and understory either return or come in where understory trees had blocked them. In general, a greater number of prey species favor a moderate canopy closure (40 to 69 percent), medium size (<4 acres) openings and a medium to high level of interspersion of seral stages within forest

habitats (Reynolds et al. 1992), which are conditions that will be created by the proposed thinning treatments.

Herbicide treatments are not anticipated to adversely affect goshawk prey. The proposed application rate should not have adverse impacts to avian or mammal prey species. Glyphosate may have sub-lethal adverse effects to small mammals who consume insects at the high analyzed exposure rate. The higher application rate analyzed in the upper exposure scenario is likely only to occur in small areas if it occurs at all and amount of prey impacted would be limited. Therefore, there should be no substantial mortality to impact prey populations. Also, squirrels and rabbits, their primary prey, do not consume enough of their diet in insects to have adverse effects from insects alone, and consumption of contaminated vegetation by small mammals was below the threshold of concern, and thus typical small mammals taken as prey would not be adversely affected.

Cumulative Effects

Following implementation of Alternative 1, moderate quality habitat acres would not change but nesting habitat would be reduced and the development of nesting habitat would be delayed through these treatments. Foraging habitat quality may temporarily decrease or remain the same but should increase in quality in the long-term (10-20 years). Alternative 1 would alter 9% of the available goshawk habitat. When this is combined with past treatments in the cumulative effects analysis (CEA) area, 37% of the goshawk habitat in the CEA area will have been treated. However, although some nesting habitat is being degraded, habitat is not being removed and 72% of the CEA area would remain in suitable goshawk habitat following implementation of Alternative 1.

Future projects on private land will alter or remove an additional 467 acres of goshawk habitat, only 8 acres of which is nesting habitat. There are no future vegetation treatment projects planned on National Forest System lands in the project area.

Because Alternative 1 protects and maintains habitat in goshawk PACs, reduces the risk of habitat loss due to wildfire, and uses an LOP to minimize disturbance to known goshawk territories, it is not expected to contribute towards adverse cumulative effects to the northern goshawk.

Alternative 3

Direct and Indirect Effects

Effects to northern goshawk differ from Alternative 1 in that less acreage would be treated and trees between 12 and 30 inches in diameter would be retained. These trees provide a greater diversity in stand structure, which provides screening to protect goshawks and reproductive areas from predators and weather. When compared with Alternative 1, less suitable habitat acreage would be proposed to be prescribed burned (2,295 fewer acres) or thinned (45 fewer acres) throughout the project area. Overall, 2,355 less habitat acres will be treated with Alternative 3 than Alternative 1.

Because detailed information about preferred habitat is conflicting and varied, it is unknown if retaining trees greater than 12 inches in diameter would result in better or equal habitat suitability compared to the other action alternatives. However, understory structure would be more open than its current state and most likely foraging efficiency would increase somewhat. Prey species may or may not be as affected initially by treatments due to a lower understory growth response to a lower canopy cover reduction; however downed woody material would still be reduced. Alternative 3 would maintain suitable nesting habitat and is unlikely to lower the quality of goshawk nesting or foraging habitat.

Alternative 3 would not include prescribed burning treatments in goshawk PACs. Fire risk to PACs would be higher when compared to Alternatives 1, 4 and 5, but would be less than under Alternative 2. Higher wildfire intensity is likely in those PACs that are not surrounded by treatments or not prescribed burned as in Alternative 1.

Cumulative Effects

Cumulative effects would be reduced compared to Alternative 1.

Alternative 4

Direct and Indirect Effects

Effects would be same as Alternative 1, except that when compared with Alternative 1, slightly less habitat acreage would be proposed to be prescribed burned (56 fewer acres) or thinned (471 fewer acres) throughout the project area. Overall, 527 less habitat acres will be treated with Alternative 4 than Alternative 1.

Cumulative Effects

Cumulative effects would be reduced compared to Alternative 1.

Alternative 5

Direct and Indirect Effects

Effects would differ from Alternative 1, in that slightly less suitable habitat acreage would be proposed to be prescribed burned (114 acres) and more would be thinned (168 acres). Overall, 63 more habitat acres will be treated with Alternative 5 and some areas would have higher canopy cover reduction. As a result of this increased intensity and canopy cover reduction, forty-six more acres of nesting habitat would be impacted and likely degraded to foraging. Harvest prescriptions would remove more vertical and horizontal structure and more canopy cover would be removed, decreasing 1% of nesting habitat throughout the analysis area.

In addition, unlike the other Action Alternatives, suitable goshawk habitat would be removed through harvest prescriptions used in Alternative 5. Some stands (137 acres) would be reduced below 40% canopy cover and foraging use would be unlikely in the resulting sparse stands. Since this would occur on limited acreage that is not in proximity to nest locations, it is not likely that this would reduce occupancy or reproductive success at known goshawk locations. In the long-term, canopy cover is expected to gradually increase in a time frame similar to Alternative 1.

Cumulative Effects

Cumulative effects would be similar to, but increased in area compared to Alternative 1.

Pacific Fisher

Affected Environment

On April 8, 2004, the US Fish and Wildlife Service determined that listing of the fisher was "warranted but precluded"; therefore appropriate status for this species is as a candidate for listing under the Endangered Species Act. Small populations of fisher occur in northwestern California and the southern Sierra in very low numbers (USDA 2001).

Habitat characteristics for Pacific fisher are believed to be mature timber stands with moderate to fairly dense canopy cover, large trees, and abundant snags and down logs (USDA Forest Service 2001 and 2004). Mature hardwoods are also thought to be important habitat components used by fisher (Ibid.), and the presence of large conifers and hardwoods is a highly significant predictor of fisher occurrence (USDA Forest Service 2005). Preferred habitat for fisher is generally found between 3,000 and 8,000 feet elevation in large, relatively unfragmented blocks of older forest, characterized by a 60% to 100% canopy closure, multistoried structure, and a high number of large snags and down logs. Suitable habitat in this analysis is defined as forested types with CWHR 4M, 4D, 5M, 5D, and 6. High Quality Habitat is defined as forested types of 60%-79%CC of CWHR 4D, and 5D. Preferred habitat or denning habitat is defined as CWHR classes 5D and density > 80%.

Fisher primarily have a diet composed of reptiles, amphibians, insects, fungi, small mammals, deer, and birds in the Sierra Nevada (Zielinski et al. 1999, Fisher and Marten in California Conference 2006), contrary to their northern counterparts that eat primarily porcupine and snowshoe hare.

The project occurs within the historic range of fisher, but track plate/camera surveys completed on the ENF in compliance with 1992/1993 and 1997 Regional survey protocols had no detections. It has been conjectured, based upon the lack of recent sightings and results of limited systematic surveys, that fisher may be extirpated from the Sierra Nevada north of Yosemite National Park and south of Lassen National Park (USDA Forest Service 2001). Nonetheless, maintenance or establishment of habitat with the potential to support fisher may be important for future recovery of the species.

Using the 2005 Forest Vegetation Inventory data, there is approximately 49,448 acres of suitable habitat (CWHR size class 4M, 4D, 5M, and 5D) within the Cumulative Effects Analysis (CEA) area. The amount of high quality habitat (CWHR 4D, 5D, and 6; canopy cover >60%) includes about 37,906 acres within the CEA area. According to the 2005 Forest Vegetation Inventory, 6,027 acres (5D, 6) would provide preferred denning/resting habitat (CWHR 5D,6 with >80% canopy) within the project area. Fisher habitat within the CEA area is concentrated throughout with denning habitat being mainly in drainages and the majority of the area is within Sierra Mixed Conifer habitat. The Long Canyon and Wallace Canyon within the project area and Rubicon Canyon to the south provides suitable corridors for movement. The suitability of the project area for fisher is limited by the level of disturbance present on adjacent and included private lands which are patchworked throughout the area. Private land within and adjacent to the project area has been highly fragmented by timber harvest activities.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Since there are no project activities proposed under this alternative, there would be no direct or cumulative effects to the Pacific fisher or its habitat. Indirect effects may result due to fire risk and potential for habitat loss. Suitable fisher habitat in and adjacent to the project area is threatened since the risk of loss to high severity wildfire for fisher habitat would not be reduced.

Alternative 2 is not expected to contribute to adverse cumulative effects. Past timber harvest has lessened habitat quality by removing larger size class trees and removing mature forest habitat characteristics. Road use and human presence within this area adds cumulatively to impacts. Since this alternative would not result in any direct impacts to Pacific fisher or its habitat, it would not contribute to any cumulative effects when combined with past activities or other projects in the area. However, indirect effects are possible since there is increasing potential for stand replacing wildfire which could reduce foraging, denning, and high quality habitat, and contribute to negative cumulative effects when combined with other projects in the CE analysis area.

Cumulative Effects

No cumulative effects are expected with this alternative.

Alternative 1

Direct & Indirect Effects

Direct disturbance to fisher from project activities is unlikely since it is unlikely that fisher occur in the area. Planned new construction or reconstruction of roads would not increase road density in the area as roads not currently designated as open for public use would be closed after project completion.

It's estimated that 74% of the stand acres proposed for treatment under Alternative 1 are considered suitable for fisher; and 0.4% of stands are denning or resting habitat, which has been described as more limiting. Eleven percent of High Quality habitat and 4% of denning habitat would be impacted by proposed treatments. Alternative 1 would not substantially decrease late-seral coniferous forest or snags, but would decrease canopy cover and would decrease large woody material. Assuming thinning reduces canopy cover to the maximum 30% and burning another estimated 5%, existing high quality fisher habitat would be degraded. About 207 acres of denning habitat would be degraded under Alternative 1 prescriptions.

Key habitat characteristics on which fisher depend include higher than average downed woody material, snags, and high canopy cover. The effects on fisher habitat from treatments following the SNFPA standards and guidelines are analyzed in the SNFPA FEIS and FSEIS and that analysis is incorporated by reference (USDA Forest Service 2001:Chapter 3, part 4.4, pgs 6-18, USDA Forest Service 2004:Chapter 4, pgs 242-253). Immediately following treatment, all of the stands treated would be within the range of habitats used by fisher due to the retention of larger size class trees, large snags per acre and canopy cover, but reduction of stand density and understory structure is likely to reduce habitat quality. Riparian areas, which are highly associated with fisher den sites, and retention areas may mitigate for negative impacts to vertical and horizontal heterogeneity within treatment units.

The retention of oaks, large snags, and large trees within the treatment units would retain important habitat components for fisher (Truex & Zielinski, 2005). Enhancing existing oak within treatment units by removing conifers that crowd and overtop oaks would help to insure the maintenance of oaks within the treatment units, as well as provide for denning and resting structures in the future. This Alternative would reduce the average patch size of dense, old forest habitat, and reduce suitable denning habitat due to more open and simplified vertical stand structure.

Prey availability for fisher may decrease in the short-term due to reduction in understory cover and downed woody material. However, prescribed burning is expected to improve habitat for the various prey species by improving herbaceous growth. These are considered immediate to short-term impacts and prey species abundance should return within 5-10 years after all treatments are completed. It is unlikely that fisher would be occupying habitat in the Blacksmith area in the near-term. In the long-term, foraging opportunities for fisher would be enhanced in these areas by increased prey diversity once previously shaded-out shrubs and understory vegetation develop in canopy gaps following treatments. Riparian buffers, retention units and archeological sites would provide some areas where prey species habitat would remain untouched or where prey abundance will not change significantly and may serve as refuges throughout treatment areas.

As described for the spotted owl, burning and thinning within these mature and late-seral stands would benefit fisher by decreasing the risk of losing the stands to catastrophic wildfire through reducing ground and ladder fuels, and by restoring fire as a natural process in the ecosystem. This should help

protect nearby fisher habitat from stand replacing fires and addresses one of the threats to the continued existence of the fisher in the Sierra Nevada (Lamberson et al. 2000). In a recent analysis performed for the Forest Service by the Conservation Biology Institute (Spencer et al 2008), simulations (4-8% of landscape treated every 5 years) showed that managing fuels generally had positive effects on a simulated fisher population, especially under a heightened fire regime. The negative short-term impacts to fisher were outweighed by the benefits of habitat protection. They also suggested, however, that treatments would be most beneficial if they were designed to occur outside fisher habitat.

Cumulative Effects

Two of the risk factors to the continued existence of fisher in the Sierra Nevada include the risk of habitat loss through catastrophic fire and habitat fragmentation impeding movement and re-colonization (SNSR 1998, Lamberson et al 2000). The importance of protecting mature forest conditions from loss as a result of catastrophic wildfire is exacerbated for this species, as they are known to avoid open canopy areas. It could take over 100 years to redevelop quality habitat for fisher following stand replacing wildfire. The proposed project would augment the other fuels reduction activities that have occurred within the cumulative effects analysis area in establishing strategic fuels treatments to reduce the risk of habitat loss from wildfire.

Habitat alteration is listed as one of the factors that have led to the possible extirpation of fisher in the central Sierra (USDA Forest Service 2001). Past management activities, such as clearcutting and overstory removal in the Blacksmith Project area negatively impacted fisher habitat. The main forest roads through the area may also have impacted this species by removing habitat, creating openings, and providing access for trappers.

Alternative 1 would modify about 6% of total fisher habitat and remove about 4% of denning habitat within the CEA area. Past, present and future activities will have cumulatively altered approximately 18,039 acres (37%) of fisher habitat since 1989. Since 1993, about 837 acres or 14% of denning habitat would have been altered or removed. Areas providing suitable denning habitat are limited within the Blacksmith landscape and the creation of denning habitat is probably delayed on portions of the 1,254 acres of 4D and 27 acres of 5D stands that will be mechanically thinned in Alternative 1. This project contributes approximately 25% to the impacts within the CEA area. Future projects contribute about 3% of the CEA impacts.

Since no fisher are currently believed to occupy the area, the project will not impact a fisher population but may remove some denning habitat and decrease the suitability of foraging habitat for a number of years. Alternative 1 should increase fisher habitat in the long-term by promoting tree growth and increasing the resilience of habitat to the effects of wildfire.

Alternative 3

Direct and Indirect Effects

Alternative 3 affects 2,355 less acres of fisher habitat than the PA and effects to fisher habitat are expected to be less in Alternative 3 than in the other action alternatives. Alternative 3 retains higher canopy cover in treatment units than Alternative 1 and higher stand densities will contribute to higher numbers of snags and greater recruitment of downed woody debris within treatment units. Denning habitat would not be removed with this alternative and will continue to increase within the units. Retaining trees above 12 inches in diameter will also provide more stand heterogeneity and protection from weather than in the other action alternatives. However, oaks are considered primary denning and resting trees for fishers. Alternative 3 will do less to favor oaks in treatment stands- although oaks are prolific within the project area. Old forest characteristics are more likely to remain high and Alternative 3 has the least impact of all action alternatives upon fisher habitat by retaining dense stands and complex structural attributes. Also, because Alternative 3 alters treatment units the least it maintains interior forest conditions and contributes the least to fragmentation of quality habitat.

Fire Risk to the fisher with Alternative 3 is greater than the other action alternatives but less than Alternative 2. More fisher habitat would be expected to burn at higher intensities in the analysis area in the event of a wildfire.

Cumulative Effects

Because Alternative 3 would have little direct impact on fisher habitat suitability, it would not contribute to cumulative habitat impacts.

Alternative 4

Direct and Indirect Effects

Direct and indirect effects differ from Alternative 1 in that less habitat would be treated through thinning and prescribed burning in Alternative 4. Suitable habitat treated would be 527 acres less in Alternative 4 than Alternative 1 (29 fewer acres of denning habitat and 486 fewer acres of High Quality habitat). In addition, Alternative 4 has a harvest prescription that will not reduce habitat below 70% canopy cover on 70 acres. Approximately 1,199 acres of thinning and 214 acres of prescribed burning would reduce suitability of High Quality habitat (4% of High Quality habitat would be degraded to suitable habitat). Suitability would be reduced on approximately 184 acres of denning habitat (23 acres less than Alternative 1).

Cumulative Effects

Alternative 4 would impact 2% less habitat cumulatively than Alternative 1.

Alternative 5

Direct and Indirect Effects:

Direct and indirect effects differ from Alternative 1 in that 105 fewer acres would be prescribed burned and 168 more acres would be thinned throughout the project area. Overall, 63 more habitat acres will be treated with Alternative 5 than Alternative 1. Prescriptions would remove more vertical and horizontal structure and more canopy cover would be removed with this alternative, increasing the effects of treatments on habitat. Forty-six more acres of denning habitat would be impacted, affecting about 5% of denning habitat throughout the analysis area.

Suitable habitat would become unsuitable where prescriptions reduce canopy below 40% cover. This would be expected to occur on about 148 acres of habitat in the analysis area that is currently between 40 and 50 percent canopy cover. Since this is low quality habitat for fisher, it is unlikely that this minimal acreage would affect the ability of the area to support fisher. In the long-term canopy cover and therefore fisher habitat is expected to gradually increase in a time frame similar to Alternative 1.

Cumulative Effects:

Alternative 5 would affect a slightly greater amount of fisher habitat than Alternative 1, adding to greater cumulative effects, and less fisher habitat would exist in the analysis area post treatment.

Pallid Bat and Townsend's Big-eared Bat

Affected Environment

White-nose syndrome has resulted in the death of millions of hibernating bats in the eastern United States. Although to date bat colonies in the western United States have not been affected, the impact of the disease on bats has increased the importance of managing for and maintaining healthy populations.

Pallid Bat

Habitat for the pallid bat consists of brush, hardwood and coniferous forests and dry habitats with rocky areas for roosting below 6,000 feet elevation (Philpott 1997 In USDA Forest Service 2005, USDA Forest Service 2001). Although the species has been found up to 10,000 feet elevation in the Sierra Nevada (Sherwin pers. com. 1998 In USDA Forest Service 2005), it is considered scarce and localized at this elevation (Barbour and Davis 1969 In USDA Forest Service 2005).

Pallid bats prefer day roosts where they can conceal themselves from view, such as rock crevices, tree hollows, mines, caves, and a variety of human-made structures (Ibid). Day roosts may vary but are commonly found in rock crevices, tree hollows, mines, caves and a variety of human-made structures and are generally within 500-600 meters of water (Baker et al., 2008). Tree roosting has been documented in large live and snag conifers, inside basal hollows of redwoods and giant sequoias, and bole cavities in oaks (Baker et al., 2008; USDA Forest Service, 2001). Cavities in broken branches of

black oak are very important and there is a strong association with black oak for roosting. Microclimate of roost sites is generally open canopy with little to no mid-story canopy cover, and the actual roost is below the canopy layer. Maternal roosts are typically colonies (typically between 20 to several hundred individuals).

The pallid bat is considered a foraging generalist on ground arthropods (crickets, long-horned beetles, grasshoppers, etc), and therefore most habitat and vegetation types provide habitat for prey (Colorado Division of Wildlife, 2008). Foraging occurs over open ground, where pallid bats are more often found along edges and open stands, particularly hardwoods (USDA Forest Service, 2001). Pallid bat catches its food nearly exclusively on the ground, and thus open understory canopy for capture of prey is important for the pallid bat.

Breeding occurs between May and July, with young weaned in mid-late August (Sherwin 1998 In USDA Forest Service 2005) and maternity colonies breaking up by mid-October (Barbour and Davis 1969 In USDA Forest Service 2005). Little is known about the winter habits of this species although it is thought to winter near the summer roost sites (Ibid.).

Bat acoustical surveys were performed on two mines sites within the project area. No pallid bats were detected at these sites. The distribution of this species across the Forest is unknown and no comprehensive surveys for pallid bats have been done on the forest. Habitat is located within the project area and so presence is assumed within the project area. Because of the variety of habitat in which pallid bats are found potential habitat as defined in this analysis consists of hardwood, riparian and coniferous forest habitats up to 10,000 feet. Preferred habitat is considered montane hardwood, montane hardwood conifer and montane riparian habitat due to their preference for roosting and foraging in these areas. Abandoned mine shafts from historic mining activity on the forest has likely created suitable roosting habitat for pallid bat.

Townsend's big-eared bat:

The Townsend's big-eared bat occurs throughout the west, and is distributed from the southern portion of British Columbia south along the Pacific Coast to central Mexico and east into the Great Plains (Sherwin 1998 In USDA Forest Service 2005). In California, the species is typically found in low desert to mid-elevation montane habitats, although sightings have been reported up to 10,800 feet (Philpott 1997, Brown 1996 and Sherwin 1998 in USDA Forest Service 2005). Habitat associations include desert, native prairies, coniferous forests, mid-elevation mixed conifer, mixed hardwood-conifer forests, riparian communities, active agricultural areas and coastal habitat types (Kunz and Martin 1982, Sherwin 1998 In USDA Forest Service 2005). Distribution of this species is strongly correlated with the availability of caves and cave-like roosting habitat (Sherwin 1998 in USDA Forest Service 2005). Populations have incurred serious declines over the past 40 years in parts of California (Brown 1996 in USDA Forest Service 2005).

Foraging usually begins well after dark (Kunz & Martin, 1982). Foraging associations include edge habitats along streams and areas adjacent to and within a variety of wooded habitats (Sherwin, 2002). In California, the species is shown to forage preferentially in association with native vegetation. Flight is slow and maneuverable, with the species capable of hovering (Zeiner et al., 1990) and gleaning insects off foliage. The Townsend's bat is a moth specialist, with over 90% of its diet composed of lepidopterans spp. (Sherwin, 2002).

Comprehensive surveys for Townsend's big-eared bat have not been conducted on the Eldorado National Forest. Surveys within the last 2-3 years have found Townsend Big-eared bat roost on the south side of the Rubicon in the Rock Creek Recreational Area at Mines on the Forest. None were found in the Project area during the surveys on the two mines. The distribution of this species across the Forest is unknown, but in 2010 PCWA surveys showed two other records on this forest. Based on these detections, presence within the project area is likely.
Because of the variety of habitat in which Townsend big-eared bats are found potential habitat as defined in this analysis consists of hardwood, riparian and coniferous forest habitats up to 10,000 feet. Preferred habitat is considered montane hardwood, montane hardwood conifer and montane riparian habitat due to their preference for roosting and foraging in these areas.

Environmental Consequences

Alternative 2

Direct & Indirect Effects

Since there are no project activities proposed under this alternative, there would be no direct or cumulative effects to the bats or their habitat. Indirect effects may result from increasing fire risk and greater potential for habitat loss in the absence of vegetation treatments. Snags should increase under this Alternative and would increase the quality of bat roosting habitat. Beetle activity that might increase through this alternative could increase foraging quality as well. Foraging habitat would decrease over time dense stands are less suitable for use by foraging bats.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternative 1

Direct & Indirect Effects

Activities associated with the alternative may disturb individuals that could be roosting in hardwoods, snags, or mines within or adjacent to harvest units. Prescribed burns could cause displacement of bats and possible increased risk of mortality due to predation and exposure. Smoke from prescribed burning may also disturb and displace roosting bats during active burning (usually less than two hours of smoke around any given tree). The health effects of smoke on bats are unknown, but the duration,

intensity and frequency of exposure from this project is not expected to be substantial. Since prescribed burns occur during the day, displacement of bats could result in increased mortality due to predation and exposure.

Protection of RCAs, trees over 30"dbh, large snags and hardwoods would protect roosting sites for pallid and Townsend big-eared bats. The increase of snags anticipated to occur in prescribed burn units would increase roosting sites for these bat species.

There are likely to be both beneficial and adverse effects of understory thinning and prescribed burning on foraging habitat for these bat species. On 6,451 acres, treatments may reduce foraging quality for bats in the immediate and short-term by removing understory shrubs and herbaceous species and reducing the associated invertebrate fauna. However, new growth of understory shrubs and forbs are anticipated to occur within 1-5 years. Thinning and prescribed fire may have positive effects for foraging bats by opening the stand understory sufficiently to allow for foraging where current undergrowth prevents flight. Thinning unit prescriptions are designed to leave downed woody material and pockets of untreated areas and prescribed burning units would be designed to create a mosaic, allowing unburned islands to remain, will reduce effects to foraging bats. Understory thinning, pre-commercial thinning, brush-cutting, mastication and prescribed burning may, overall, improve foraging habitat for bats by removing "clutter" that can impair echolocation.

Hardwoods, large trees and large snags would not be directly removed, except for large snags that pose a risk to woodworker safety and for operability where necessary. The short-term and long-term increase in hardwoods as a result of treatments within thinning units should increase possible bat roosting habitat. A thinned understory would improve conditions around roosting areas for bats since roosts are generally in areas that are free of immediately adjacent obstacles that might hinder emergence or allow predators access to roost sites.

Although some risk has been identified, herbicides are not anticipated to adversely affect any of these bat species. Glyphosate treatments under the highest exposure scenario are modeled to exceed the threshold of concern (NOAEL) for small mammals that consume insects, identifying some potential risk to bat species. Adverse sub-lethal effects to the pallid bat are unlikely, however, since glyphosate will be applied with backpack sprayers and treatments will not cover sufficient area to match a scenario where 50% of a pallid bat's diet would be composed of contaminated insects.

Herbicides are not expected to adversely affect the Townsend bat because their primary prey, moths, generally roosts on dark colored items such as bark or woody material during the daytime when herbicides would be applied to foliage. Given the direct foliar application method for glyphosate, it is highly unlikely that more than 50% of consumed prey would be sprayed at the highest exposure scenario rate, the scenario that would expose the Townsend's bat to enough herbicide to exceed the threshold of concern (NOAEL).

Cumulative Effects

Given the changes in forest vegetation that have been described within the Sierra Nevada over the last 100 years, it is likely that vegetation is denser between 0 and 8 feet high and that there are fewer mature hardwoods within mid-elevation stands than there were historically. This would suggest a historic reduction in foraging habitat quality. It is unclear what the cumulative effect of past actions may have been on sensitive bat species in the analysis area. Historic mining in the area has created more potential roosting habitat for pallid bat and Townsend's big-eared bat than likely occurred prior to European settlement. Timber harvest and previous fuels reduction projects have removed large trees and snags that could have been utilized by bats for roosting, however some treatments have opened the understory increasing foraging opportunities. Clearcuts may have benefited bats as they are found more often in edges and open stands.

Approximately 16,890 acres of vegetation treatments have occurred within the cumulative effects analysis area since 1993. These vegetation treatments on NFS lands which followed CASPO or SNFPA guidelines retained large trees and snags, opened up the understory, and fostered oaks growth and regeneration. Although key habitat components are maintained within fuels reduction projects on NFS lands, it is likely that some pallid or Townsend bat roosts were removed. Activities on private lands do not follow the same guidelines as NFS lands, and it is likely that private land activities have had a greater impact upon pallid bat and Townsend big-ear bat habitat, due to smaller RCA widths and retention of fewer large trees and snags. Fire exclusion has resulted in more dense stands and led to conifer encroachment in oak woodlands, which does not favor foraging by any of the bat species. Within the foreseeable future, 539 additional acres of suitable habitat would be affected by future fuels reduction and timber harvest projects on private and NFS lands.

This project maintains important habitat components and is unlikely to contribute to negative cumulative effects for pallid bats and Townsend big-eared bats.

Alternative 3

Direct and Indirect Effects

Direct and indirect effects of Alternative 3 are anticipated to be similar to Alternative 1, except that more trees in the 12-30 inch diameter range will be retained and available as roosts and less acreage will be affected by treatments. However, development and retention of hardwoods for bat foraging and roosting would not be as great under this Alternative. Also, future snag recruitment in the 12-30 inch diameter range for roosting structures is higher in Alternative 3 than in Alternatives 1, 4 or 5; this would be beneficial for bats as compared to other action alternatives.

Cumulative Effects

Cumulative effects are similar to the other action alternatives, with this project still contributing habitat change across fewer acres and of less intensity as compared to past and future projects on NFS lands. Alternative 3 contributes less than the other action alternatives to cumulative effects.

Alternative 4

Direct and Indirect Effects

The effects of Alternative 4 would also be very similar to those for Alternative 1 except 560 acres less suitable habitat would be treated under Alternative 4 than Alternative 1.

Cumulative Effects

Cumulative effects are similar to Alternative 1. Alternative 4 contributes less than the Alternative 1 to cumulative effects, but more than Alternative 3.

Alternative 5

Direct and Indirect Effects

Direct and indirect, and cumulative effects would be same as Alternative 1 except that 64 more acres of suitable habitat would be treated with this Alternative as compared to Alternative 4.

Cumulative Effects

Cumulative effects are similar to Alternative 1.

Management Indicator Species

Management Indicator Species (MIS) are animal species identified in the Sierra Nevada Forest MIS Amendment Record of Decision (ROD) signed December 14, 2007. Guidance regarding MIS set forth in the Eldorado National Forest LRMP as amended by the 2007 SNF MIS Amendment ROD directs Forest Service resource managers to (1) at project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS, as identified in the Eldorado National Forest LRMP as amended. Analysis of effects to MIS species are summarized from Grasso (2013 b) for aquatic MIS and from Ebert, J. (2013) for terrestrial MIS. For terrestrial species, cumulative effects analysis includes the project area and a 1.5 mile project area buffer as the cumulative effects analysis area.

Lacustrine/Riverine Habitat (Aquatic Macroinvertebrates)

Aquatic or Benthic Macroinvertebrates (BMI) were selected as the MIS for riverine and lacustrine habitat in the Sierra Nevada.

Affected Environment

Current Condition of the Habitat Factor(s) in the Project Area: A Geographic Information System (GIS) analysis determined that there are approximately: 100 miles of perennial streams, 26 miles of intermittent streams, and 339 miles of ephemeral streams within the project area boundary. There are no lakes or ponds within the project boundary.

Status and Trend

Sierra Nevada MIS monitoring for aquatic (benthic) macroinvertebrates (BMI) was conducted in 2009 and 2010 (Furnish 2010). Benthic macroinvertebrates were collected from stream sites during both the 2009 and 2010 field seasons according to the Reachwide Benthos (Multihabitat) Procedure (Ode 2007). The initial BMI data from 2009 and 2010 found 46% (6 of 13) of the surveyed streams indicate an impaired condition and 54% (7 of 13) indicate a non-impaired condition (see USDA Forest Service 2010a, Table BMI-1). This is similar to the Index of Biological Integrity (IBI) conditions estimated by Moyle and Randall (1996). Therefore, current data from the Sierra Nevada indicate that status and trend in the RIVPACS scores appears to be stable.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Under Alternative 2 no direct impacts would occur, however the risk of a large wildfire in the project area would be greater than under Alternative 1. The potential effects of a large wildfire could include a short-term (generally <5 years) degradation of water quality and aquatic habitat in the project area, including an increase in flow, increase in sedimentation, and decrease in water surface shade. The severity and extent of such affects from large wildfires is highly variable and depends on many factors. Wildfires in riparian areas are likely to spark vegetation regeneration as well as contribute large woody debris to streams as a result of fire-killed trees that may offset some of these effects.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 1, 3, 4, and 5

Direct & Indirect Effects

Long term impacts to stream habitats from project activities are not expected. Potential increases in lateral erosion and stream bank destabilization in streams will be minimized through the restriction of ground-based equipment within exclusion buffers as well as limited actions and or treatments occurring within the riparian zone. Historic vertical erosion (inner gorges) within headwater channels of Long Canyon Creek as a result of historic mining; and loss of downed woody debris on Big Grizzly Creek appears to be not rapidly advancing and ground based activities as well as treatments will be

minimal in these areas. Although the project occurs within Riverine habitat, the protection measures incorporated into the design criteria are in place so that changes in the following factors: Flow, Sedimentation, and Water surface shade will either not be measurable, short-term or beneficial.

Cumulative Effects to Habitat

The Blacksmith ERP in conjunction with past, present, and reasonably foreseeable future activities will not result in effects to macroinvertebrate habitat. Any changes to flow, sediment, and water surface shade will be short –term, not measureable, or beneficial. Based on the potential direct and indirect effects to aquatic and aquatic-dependent species and the Design Features incorporated, overall cumulative effects to flow, sedimentation and water surface shade from implementation of Alternative 1 to aquatic macroinvertebrates and their habitats would be minimal.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

Although conditions in several headwater stream reaches, where project activities are to occur, are in a less stable condition from past activities, downstream macroinvertebrates are likely to be little affected by project activities. Therefore, a change in trends to habitat or macroinvertebrate structure across the Sierra Nevada bioregion as a result of the project is not expected since changes to flow, sedimentation, and shade would be negligible or short-term in duration.

Shrubland (West-Slope Chaparral) Habitat (Fox Sparrow)

The fox sparrow was selected as the MIS for shrubland (chaparral) habitat on the west-slope of the Sierra Nevada, comprised of montane chaparral (MCP), mixed chaparral (MCH), and chamise-redshank chaparral (CRC) as defined by the California Wildlife Habitat Relationships System (CWHR) (CDFG 2005).

Affected Environment

There are approximately 2,062 acres of shrubland (chaparral) habitat [CWHR montane chaparral (MCP), mixed chaparral (MCH), and chamise-redshank chaparral (CRC) within the analysis area. In general most shrub type habitats occur on the south side of the project area, typically within plantations where shrubs are competing with planted conifers (primarily ponderosa pine). In the steeper southern aspects the shrub component has competed strongly with the planted trees and has developed into mature to decadent shrub with dense canopy cover over the past 40 years since the plantations were established. On less steep ground, rocky soils, and north facing slopes the shrubs are less developed with sparse to open shrub canopy cover component.

Status and Trend

There are currently 1,009,681 acres of west-slope chaparral shrubland habitat on National Forest System lands in the Sierra Nevada. Over the last two decades, the trend is slightly increasing (changing from 8% to 9% of the acres on National Forest System lands).

Monitoring of the fox sparrow across the ten National Forests in the Sierra Nevada has been conducted since 2009 in partnership with PRBO Conservation Science, as part of a monitoring effort that also includes mountain quail, hairy woodpecker, and yellow warbler (USDA Forest Service 2010a, http://data.prbo.org/partners/usfs/snmis/). Fox sparrows were detected on 36.9% of 1659 point counts in 2009 and 44.3% of 2266 point counts in 2010, with detections on all 10 national forests in both years. The average abundance (number of individuals recorded on passive point count surveys) was 0.563 in 2009 and 0.701 in 2010. These data indicate that fox sparrows continue to be distributed across the 10 Sierra Nevada National Forests. In addition, the fox sparrows continue to be monitored and surveyed in the Sierra Nevada at various sample locations by avian point count, spot mapping, mist-net, and breeding bird survey protocols. These are summarized in the 2008 Bioregional Monitoring Report (USDA Forest Service 2008). Current data at the rangewide, California, and Sierra Nevada scales indicate that, although there may be localized declines in the population trend, the distribution of fox sparrow populations in the Sierra Nevada is stable.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Under Alternative 2, no direct or indirect effects would occur to shrubland habitat because no project activities would occur. Shrub would continue to mature over time.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 1, 3, 4, and 5

Direct & Indirect Effects

This project would prescribe burn, masticate, herbicide, and/or pile the brush component within up to 229 acres of shrubland habitat. These actions would remove shrub habitat from 55 acres of shrubland habitat in Alternative 4 up to 229 acres of shrubland in Alternatives 1 and 5. Some species of brush stump sprout after mastication, and thus masticated areas would be expected to regain their shrub component the quickest of all treatments. Brush is also expected to resprout fairly quickly following under burning. Piling removes the brush and its roots. Herbicide treatments would be expected to reduce the amount of shrub component (particularly shrub crown) for the longest period of time. The majority of the treatment within shrublands habitat under Alternatives 1, 4, and 5 is underburning (72%), followed by tree thinning, piling and burning (14%), herbicide treatments (11%) and mastication (2%). The majority of the treatment within shrublands under Alternative 3 is tree thinning, piling, and burning (56%) followed by herbicide treatments (18%). Overall effects to the shrub canopy, density, and decadence would be temporary effects since shrub would be expected to grow

back in these areas. From experience with past fuels reduction projects, shrub within thinned units and prescribed fire treatments can return to dense canopy cover in 3-10 years.

Cumulative Effects to Habitat

There is 2,064 acres of shrubland habitat in the cumulative effects analysis area. The project activities that temporarily reduce shrub ground cover and decadence will affect up to 229 acres, and when combined with cumulative actions affects a total of 819 acres of shrubland habitat, or 40% of shrubland habitat in the analysis area. The shrub component has likely recovered in some areas where shrub habitat may have been affected by past actions. Thus reduction in habitat may result in a local reduction in fox sparrows until shrub regenerates at the cumulative effects analysis scale.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

Affecting 819 acres cumulatively is not expected to alter the existing slightly increasing trend in shrubland habitat across the bioregion, nor will it lead to a change in the distribution of fox sparrows across the Sierra Nevada bioregion, due to the small scale of the project and cumulative effects area compared to the bioregion (less than 1%).

Oak-Associated Hardwoods and Hardwood/Conifer Habitat (Mule deer)

The mule deer was selected as the MIS for oak-associated hardwood and hardwood/conifer in the Sierra Nevada, comprised of montane hardwood (MHW) and montane hardwood-conifer (MHC) as defined by the California Wildlife Habitat Relationships System (CWHR) (CDFG 2005). Mule deer range and habitat includes coniferous forest, foothill woodland, shrubland, grassland, agricultural fields, and suburban environments (CDFG 2005).

Affected Environment

A total of 23,653 acres of oak associated hardwood and hardwood/conifer habitat [CWHR montane hardwood (MHW), montane hardwood-conifer (MHC)] habitat is within the analysis area.

Status and Trend

There are currently 808,006 acres of oak-associated hardwood and hardwood/mixed conifer habitat on National Forest System lands in the Sierra Nevada. Over the last two decades, the trend is slightly increasing (changing from 5% to 7% of the acres on National Forest System lands).

The mule deer has been monitored in the Sierra Nevada at various sample locations by herd monitoring (spring and fall) and hunter survey and associated modeling (CDFG 2007, 2010). These data indicate that mule deer continue to be present across the Sierra Nevada, and current data at the rangewide, California, and Sierra Nevada scales indicate that, although there may be localized declines in some herds or Deer Assessment Units, the distribution of mule deer populations in the Sierra Nevada is stable.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Under Alternative 2, no direct or indirect effects would occur to oak associated habitat because no project activities would occur. Oak would continue to decline over time due to competition with conifers.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 1, 4, and 5

Direct & Indirect Effects

A total ranging between 2,081 acres under Alternative 4 to 2,142 acres under Alternative 5 of oak associated habitat would be affected by the project. The project would be anticipated to improve the oak component of oak associated habitat through the removal of competing and overtopping conifers, allowing for more sunlight and less competition of oaks with adjacent vegetation (primarily conifers). A few incidental oak hazard trees may be fallen for safety or operations reasons, although these incidental trees would be too few to affect overall CWHR types. Prescribed fire and small openings created through varied spacing tree removal prescriptions may result in a pulse of oak regeneration.

Cumulative Effects to Habitat

The cumulative effects analysis contains 23,653 acres of oak associated habitat. Past, current, and anticipated future activities would be expected to affect 4,491 acres of the 23,653 acres of habitat, or 19% of the habitat within the analysis area. Because these activities are expected to maintain or improve oak habitat, the project would be expected to slightly increase oak associated habitat for mule deer in the analysis area.

Alternative 3

Direct and Indirect Effects

A total of 768 acres of oak associated habitat would be affected by the Alternative 3. The project would not remove overtopping or encroaching conifers from oaks due to the overall dbh limit. Most overtopping conifers are greater than 12 inches dbh, and thus this alternative would not be effective in increasing the health or persistence of oak in the project area.

Cumulative Effects to Habitat

Past, current, and anticipated future activities would be expected to affect 3,568 acres of the 23,653 acres of habitat, or 15% of the habitat within the analysis area. Because direct and indirect effects from Alternative 3 will not affect the health or persistence of oak in the project area, and past/future projects

may have improved oak habitat, this alternative is not anticipated to alter the trend of oak associated habitat within the analysis area.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

Improvements in oak associated habitats from past, future, and the Blacksmith project would contribute to the slightly increasing trend in oak habitat across the Sierra Nevada bioregion for Alternatives 1, 4, and 5. However, because the small scale of the project area compared to the bioregion this change would not be expected to alter the population trend or range for mule deer. Since Alternatives 2 and 3 do not alter the existing habitat trend in the analysis area, these alternatives also would not be expected to alter the Sierra Nevada bioregional oak associated habitat trend nor mule deer distribution.

Early and Mid Seral Coniferous Forest Habitat (Mountain quail)

Affected Environment

There is a total of 34,602 acres of early and mid seral coniferous habitat in the analysis area [CWHR ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree sizes 1, 2, 3, and 4, all canopy closures]. Most of this habitat is in the mid seral stage, mostly consisting of 4M and 4D CWHR types. No white fir, red fir, or eastside pine types are present. Existing understory shrub canopy cover closure is unknown in the forest vegetation inventory; however, from observations of the treatment units there is a range of dense stands with little vegetation understory, to dense stands with tan oak understory, to dense plantations with shrub under and overstory, to plantations with pockets of scattered shrub understory. Thus there is a wide variety of shrub understory within the early and mid seral coniferous habitat. Scattered pockets of shrub understory tended to be present within the CWHR size 3 and 4 stands with open to moderate canopy cover, with denser stands tending to lack understory canopy cover. Younger stands, CWHR size 1 and 2, tended to have at least some overstory shrub component as well as developed shrub understory.

Status and Trend

There are currently 530,851 acres of early seral and 2,776,022 acres of mid seral coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat on National Forest System lands in the Sierra Nevada. Over the last two decades, the trend for early seral is decreasing (changing from 9% to 5% of the acres on National Forest System lands) and the trend for mid seral is increasing (changing from 21% to 25% of the acres on National Forest System lands).

Monitoring of the mountain quail across the ten National Forests in the Sierra Nevada has been conducted since 2009 in partnership with PRBO Conservation Science, as part of a monitoring effort that also includes fox sparrow, hairy woodpecker, and yellow warbler (USDA Forest Service 2010a, http://data.prbo.org/partners/usfs/snmis/). Mountain quail were detected on 40.3 percent of 1659 point counts (and 48.6% of 424 playback points) in 2009 and 47.4% of 2266 point counts (and 55.3%

of 492 playback points) in 2010, with detections on all 10 national forests in both years. The average abundance (number of individuals recorded on passive point count surveys) was 0.103 in 2009 and 0.081 in 2010. These data indicate that mountain quail continue to be distributed across the 10 Sierra Nevada National Forests. In addition, mountain quail continue to be monitored and surveyed in the Sierra Nevada at various sample locations by hunter survey, modeling, and breeding bird survey protocols. These are summarized in the 2008 Bioregional Monitoring Report (USDA Forest Service 2008). Current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of mountain quail populations in the Sierra Nevada is stable.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Under Alternative 2, no direct effects would occur to early and mid seral coniferous habitat because no project activities would occur. Early and mid seral would continue along the succession trajectory at the current pace.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 1, 4, and 5

Direct & Indirect Effects

Changes in the percentage of canopy cover would vary within the mechanical thinning units. Thus some stands would have a larger change than others in CWHR canopy cover class. Approximately 3,000 acres (ranging from 2,691 acres under Alt. 4 to 3,165 acres under Alt. 5) of 4D would be likely be reduced to 4M through thinning. Overall between 3,561 and 4,067 acres of early and mid seral habitat would be affected by the project.

Understory shrub canopy cover within this habitat would be reduced where it is available through a combination of mastication, piling, herbicide, and/or prescribed burning. Some species of brush stump sprout after mastication, and thus masticated areas would be expected to regain their shrub component the quickest of all treatments. Brush is also expected to resprout fairly quickly following under burning. Piling removes the brush and its roots. Herbicide treatments would be expected to reduce the amount of shrub component (particularly shrub crown) for the longest period of time. Overall effects to the shrub canopy, density, and decadence would be temporary effects since shrub would be expected to grow back in these areas. From experience with past fuels reduction projects, masticated shrub in plantations can return in the understory in 3-10 years, although this varies depending on how much the canopy cover is opened at a very fine scale. Sometimes the brush reduction is very effective and the growth of the overstory trees limits shrub regeneration to isolated patches in the understory. Prescribed burning in general tends to stimulate the growth of shrub and forbs in the understory, generating forage

for mountain quail. Mature shrub needed for hiding and thermal cover would take longer to reestablish, at least 10 years.

Cumulative Effects to Habitat

The cumulative effects analysis area is the 1.5 mile buffered project area and contains 34,602 acres of early and mid seral coniferous habitat for mountain quail. Cumulatively 17,430 acres, or 50%, of early and mid seral coniferous habitat have been affected in the past, likely to be affected in the future, or would be affected by this project. Overall cumulative activities across 50% of the habitat in the analysis area mostly maintain CHWR canopy cover and size classes while reducing shrub and understory habitat components, and promoting an accelerated development of late seral habitat. The project will maintain basic early and mid seral coniferous habitat based upon CWHR types with long term decreases as habitat matures into late seral habitat.

Alternatives 3

Direct & Indirect Effects

Alternative 3 is the same in direct and indirect effects to Alternatives 1, 4, and 5 except that Alternative 3 affects less acres of early and mid seral coniferous forest (2,190 acres). Because the smaller trees that would be removed in this alternative contribute little to canopy cover within stands, canopy cover would be reduced less than all other action alternatives. There would be minimal, if any change to CWHR types. The treated areas would be expected to proceed slower towards late seral conditions due to more competition between trees.

Cumulative Effects to Habitat

Overall cumulative activities across 15,551 acres or 45% of the habitat in the analysis area mostly maintain CHWR canopy cover and size classes while reducing shrub and understory habitat components, and promoting an accelerated development of late seral habitat. The project will maintain basic early and mid seral coniferous habitat based upon CWHR types with long term decreases as habitat matures into late seral habitat.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

The project would be expected to maintain current early and mid seral coniferous habitat but in the long term contribute to the decreasing trend in early seral coniferous habitat and deter from the increasing trend for mid seral coniferous habitat; however due to the small scale of the project compared to the Sierra Nevada bioregion, the changes in these trends would be very small. Thus do to the very small decreases in overall mountain quail habitat across the bioregion, the project would not lead to a change in the distribution of mountain quail across the Sierra Nevada bioregion.

Late Seral Open Canopy Coniferous Forest Habitat [Sooty (blue) grouse]

Affected Environment

Total late seral open canopy coniferous forest habitat [CWHR ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 5, canopy closures S and P] in the analysis area is 328 acres. Current forest vegetation inventory does not include understory shrub canopy closure information, and thus this information is described qualitatively. In general areas with less than 40% canopy cover tend to have an understory shrub component, as the analysis area is generally lower elevation coniferous forest.

Status and Trend

There are currently 63,795 acres of late seral open canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine) habitat on National Forest System lands in the Sierra Nevada. Over the last two decades, the trend is decreasing (changing from 3% to 1% of the acres on National Forest System lands).

The sooty grouse has been monitored in the Sierra Nevada at various sample locations by hunter survey, modeling, point counts, and breeding bird survey protocols, including California Department of Fish and Game Blue (Sooty) Grouse Surveys (Bland 1993, 1997, 2002, 2006); California Department of Fish and Game hunter survey, modeling, and hunting regulations assessment (CDFG 2004a, CDFG 2004b); Multi-species inventory and monitoring on the Lake Tahoe Basin Management Unit (LTBMU 2007); and 1968 to present – BBS routes throughout the Sierra Nevada (Sauer et al. 2007). These data indicate that sooty grouse continue to be present across the Sierra Nevada, except in the area south of the Kern Gap, and current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of sooty grouse populations in the Sierra Nevada north of the Kern Gap is stable

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Under Alternative 2 no direct effects would occur to late seral open canopy coniferous habitat because no project activities would occur.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 1, 3, 4, and 5

Direct & Indirect Effects

CWHR size and canopy cover would not be expected to change in these areas in any action alternative, since thinning and removal of understory trees will be minimal in these 5P and 5S stands. Understory shrub canopy cover within this habitat would be reduced where it is available through a combination of mastication, piling, herbicide, and/or prescribed burning. Overall effects to the shrub canopy, density, and decadence would be temporary effects since shrub would be expected to grow back in these areas. Because the pre-project canopy cover is less than 40% in sooty grouse habitat, it would be expected that shrub, brush, and forbs would return with vigor due to the available sunlight in the open canopy cover. Prescribed burning in general tends to stimulate the growth of shrub and forbs in the understory, generating forage for sooty grouse. Mature shrub would take longer to reestablish, at least 10 years.

Cumulative Effects to Habitat

The cumulative effects analysis area is the 1.5 mile buffer around the project area and contains 328 acres of late seral open canopy coniferous habitat for sooty grouse. Cumulatively, 287 acres or 88%, of late seral open canopy coniferous habitat has been affected in the past, likely to be affected in the future, or would be affected by the project. Overall cumulative activities across 88% of the habitat in the analysis area maintain CHWR canopy cover and size classes while reducing shrub and understory habitat components, and promoting development of late seral closed canopy habitat. The project (34% of the overall cumulative effects) will maintain basic late seral open canopy coniferous habitat based upon CWHR types with long term decreases as habitat matures into late seral closed canopy habitat.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

The Blacksmith Ecological Restoration project would be expected to maintain current late seral open canopy coniferous habitat but in the long term contribute to the decreasing trend as canopy cover increases; however due to the small scale of the project compared to the Sierra Nevada bioregion, the contribution toward the decreasing trend in the long term would be very small. Thus do to the very small decreases in overall sooty grouse habitat across the bioregion, the project would not lead to a change in the distribution of sooty grouse across the Sierra Nevada bioregion.

Late Seral Closed Canopy Coniferous Forest Habitat (California spotted owl, American marten, and northern flying squirrel)

Affected Environment

There is a total of 7,425 acres of late seral closed canopy coniferous forest habitat [CWHR ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), tree size 5 (canopy closures M and D), and tree size 6] in the project area. Based on modeling of stand exam data, larger snag levels are higher than the minimum required. On average, across the treated landscape within the

analysis area, there are approximately 11 snags >16 inches in diameter within treatment units according to stand exams of selected units and Forest Vegetation Simulator modeling (Walsh 2013).

Status and Trend

There are currently 1,006,923 acres of late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat on National Forest System lands in the Sierra Nevada. Over the last two decades, the trend is slightly increasing (changing from 7% to 9% of the acres on National Forest System lands); since the early 2000s, the trend has been stable at 9%.

California spotted owl. California spotted owl has been monitored in California and throughout the Sierra Nevada through general surveys, monitoring of nests and territorial birds, and demography studies (Verner et al. 1992; Gutierrez et al. 2008, 2009, 2010; USDA Forest Service 2001, 2004, 2006b; USFWS 2006; Sierra Nevada Research Center 2007, 2008, 2009, 2010). Current data at the rangewide, California, and Sierra Nevada scales indicate that, although there may be localized declines in population trend [e.g., localized decreases in "lambda" (estimated annual rate of population change)], the distribution of California spotted owl populations in the Sierra Nevada is stable.

American marten. American marten has been monitored throughout the Sierra Nevada as part of general surveys and studies since 1996 (e.g., Zielinski et al. 2005, Moriarty 2009). Since 2002, the American marten has been monitored on the Sierra Nevada forests as part of the Sierra Nevada Forest Plan Amendment (SNFPA) monitoring plan (USDA Forest Service 2005, 2006b, 2007b, 2009, 2010b). Current data at the rangewide, California, and Sierra Nevada scales indicate that, although marten appear to be distributed throughout their historic range, their distribution has become fragmented in the southern Cascades and northern Sierra Nevada, particularly in Plumas County. The distribution appears to be continuous across high-elevation forests from Placer County south through the southern end of the Sierra Nevada, although detection rates have decreased in at least some locatized areas (e.g., Sagehen Basin area of Nevada County).

northern flying squirrel. The northern flying squirrel has been monitored in the Sierra Nevada at various sample locations by live-trapping, ear-tagging, camera surveys, snap-trapping, and radiotelemetry: 2002-present on the Plumas and Lassen National Forests (Sierra Nevada Research Center 2007, 2008, 2009, 2010), and 1958-2004 throughout the Sierra Nevada in various monitoring efforts and studies (see USDA Forest Service 2008, Table NOFLS-IV-1). These data indicate that northern flying squirrels continue to be present at these sample sites, and current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of northern flying squirrel populations in the Sierra Nevada is stable.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Under Alternative 2 no direct effects would occur to late seral closed canopy coniferous habitat because no project activities would occur.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 1 and 5

Direct & Indirect Effects

CWHR tree size class would not be expected to change from proposed activities. Changes in the percentage of canopy cover would vary within the mechanical thinning units. Under Alternative 1, measured decreases in canopy cover, as modeled in FVS, are expected to be approximately 9% and range from a minimum reduction in some modeled units to a maximum modeled reduction of 28% (Walsh 2013). Higher reductions in canopy closure are expected under Alternative 5, particularly where stands are at the lower end of the canopy cover measure prior to thinning and along the ridge top areas where stands would be more heavily thinned. Under Alternative 5, average canopy cover reduction from mechanical thinning is 11% with a maximum modeled reduction of 46% (Ibid.)

In most cases it is unlikely that 5D stands would be reduced, since canopy cover is typically contained in the larger, overstory trees that would be retained. Experience with similar treatments on the Georgetown District on the Eldorado National Forest have shown that canopy cover in 5D and 5M stands are typically preserved as the main contributors of canopy cover are the larger trees in the stand that are not being removed though thinning treatments similar to the proposal in this project. Less than 1% of the 5D stands may be expected to be temporarily reduced from 5D to 5M, however because these areas typically have the valuable structure for wildlife, placement of retention areas in units that focus on these structures is expected to result in fewer acres of 5D being reduced to 5M (Walsh 2013). The project activities are anticipated to result in an increase in snags and down logs in the short term.

Cumulative Effects to Habitat

The cumulative effects analysis area is the 1.5 mile buffer around the project area and contains 7,425 acres of late seral closed canopy coniferous habitat. The reduction in the CWHR canopy cover class on at most 315 acres of 5D habitat, the increases in snag and log densities across the analysis area, the maintenance of minimum 40% canopy cover, the retention of the largest trees within thinning units, and the reduction in risk of stand replacing wildfire will maintain late seral closed canopy coniferous forest in the cumulative effects analysis area.

Alternatives 3

Direct & Indirect Effects

The direct and indirect effects of Alternative 3 are the same as Alternatives 1 and 5 except that Alternative 3 would, on average reduce canopy cover the least of all action alternatives, since fewer trees would be removed. Thus there would be no change in CWHR canopy cover class from Alternative 3.

Cumulative Effects to Habitat

Cumulative effects would be similar to Alternative 1.

Alternatives 4

Direct & Indirect Effects

Alternative 4, would include 75 acres of commercial thinning within 5D stands, 12 acres fewer than proposed under Alternative 1 (55 acres fewer than proposed under Alternative 5). Eight acres of mechanical thinning within 5D stands would maintain greater than 70% canopy cover. Snag numbers are expected to be higher in the short and long term under Alternative 4 than with Alternatives 1 and 5, but lower than Alternative 2.

Cumulative Effects to Habitat

Cumulative Effects would be similar to Alternative 1.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

In Alternatives 1, 4, and 5, a potential change of 269 acres, 230, or 315 acres, respectively of 5D to 5M CWHR habitat type out of 7,131 acres 5D available, the project, would when combined with cumulative effects where projects generally maintain at minimum 5M habitat and promote resiliency to stand replacing fires, not alter the existing trend in the habitat, nor with it lead to a change in the distribution of the California spotted owl across the Sierra Nevada bioregion. In Alternatives 2 and 3 there would be no change of CWHR habitat type in the project area and thus would not alter the existing trend in the habitat, nor will it lead to a change in the distribution of the California spotted owl across the Sierra Nevada bioregion.

Snags in Green Forest Ecosystem Component (Hairy woodpecker)

Affected Environment

The analysis area has approximately 50,281 acres of forest with CWHR size class of 4 or larger. Although all forest types could have snag value for the hair woodpecker, snags 15 inches or larger in CWHR size class stands 3 and smaller would be rare isolated instances, since trees are generally be much smaller than 15 inches dbh.

Status and Trend

The current average number of medium-sized and large-sized snags (> 15" dbh, all decay classes) per acre across major coniferous and hardwood forest types (westside mixed conifer, ponderosa pine, white fir, productive hardwoods, red fir, eastside pine) in the Sierra Nevada ranges from 1.5 per acre in eastside pine to 9.1 per acre in white fir. In 2008, snags in these types ranged from 1.4 per acre in eastside pine to 8.3 per acre in white fir (USDA Forest Service 2008).

Data from the early-to-mid 2000s were compared with the current data to calculate the trend in total snags per acre by Regional forest type for the 10 Sierra Nevada national forests and indicate that, during this period, snags per acre increased within westside mixed conifer (+0.76), white fir (+2.66), productive hardwoods (+0.35), and red fir (+1.25) and decreased within ponderosa pine (-0.16) and eastside pine (-0.14) Detailed information by forest type, snag size, and snag decay class can be found in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

Monitoring of the hairy woodpecker across the ten National Forests in the Sierra Nevada has been conducted since 2009 in partnership with PRBO Conservation Science, as part of a monitoring effort that also includes mountain quail, fox sparrow, and yellow warbler (USDA Forest Service 2010a, http://data.prbo.org/partners/usfs/snmis/). Hairy woodpeckers were detected on 15.1% of 1659 point counts (and 25.2% of 424 playback points) in 2009 and 16.7% of 2266 point counts (and 25.6% of 492 playback points) in 2010, with detections on all 10 national forests in both years. The average abundance (number of individuals recorded on passive point count surveys) was 0.116 in 2009 and 0.107 in 2010. These data indicate that hairy woodpeckers continue to be distributed across the 10 Sierra Nevada National Forests. In addition, the hairy woodpeckers continue to be monitored and surveyed in the Sierra Nevada at various sample locations by avian point count and breeding bird survey protocols. These are summarized in the 2008 Bioregional Monitoring Report (USDA Forest Service 2008).Current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of hairy woodpecker populations in the Sierra Nevada is stable.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Under Alternative 2, no direct effects would occur to snags in green forest habitat because no project activities would occur. The number of snags is expected to increase over the long-term, primarily due to mortality caused by insect and disease. The recruitment of snags would continue to be dependent upon the interplay of precipitation levels, stand density and other natural elements, such as the incidence of insect attack, natural mortality, and amounts of wind throw.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 1, 4, and 5

Direct & Indirect Effects

The project would affect up to 4,950 acres (ranging from 4,358 acres under Alt. 4 to 4,950 acres under Alt. 5) of CWHR size class 4 or larger stands. Some incidental reduction in the number of existing snags is expected as a result of incidental hazard tree falling; however this is not expected to have an impact on overall snag averages across the project area. Short-term direct effects upon snags and down logs are also likely to occur as part of the prescribed fire, machine piling, and pile burning activities.

Understory thinning of trees reduces the basal area, reducing competition between trees that drives snag creation. However, this effect was taken into account when estimating the expected changes in snag levels after the project. Projections for future snags shows that the numbers of snags per acre greater than 16 inches dbh are expected to increase in the short-term, likely due to the combination of treatment activities and current stresses on trees within the stand. Compared to Alternative 2, snag numbers are reduced in the long-term from current numbers under each alternative. Snag numbers are expected to be higher in the short and long term under Alternative 3 and Alternative 4 than with Alternative 1, but lower than the no action.

Cumulative Effects to Habitat

The cumulative effects analysis area is the 1.5 mile buffer around the project area and contains 50,281 acres of CWHR size class 4 or larger stands. Cumulatively past, present, and future actions affect 19,224 acres of habitat, or 38% of available habitat in the analysis area. Overall the project increases snag levels and is expected to improve snag habitat in green forest.

Alternative 3

Direct & Indirect Effects

The project would affect 2,343 acres of CWHR size class 4 or larger stands, which is 47% - 54% fewer acres than under the other action alternatives. Snag numbers are expected to be higher in the short and long term with Alternative 3 than with the other action alternatives, but lower than the no action. Alternative 3 would leave a higher residual basal area, which would drive natural recruitment of snags to occur sooner in Alternative 3 than in Alternatives 1, 4, and 5.

Cumulative Effects to Habitat

Overall the project increases snag levels and is expected to improve habitat snag habitat in green forest.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

The maintenance or increase in snag levels in the project would contribute to the increasing trend of snag levels in mixed conifer habitat and contribute to reversing the decreasing trend of snag levels within ponderosa pine habitat. Maintenance or increases in snag levels that contribute to improving habitat quality for the hairy woodpecker on less than 1% of its range in the Sierra Nevada bioregion would not lead to a change in the distribution of hairy woodpecker across the Sierra Nevada bioregion.

Air Quality

The Clean Air Act requires EPA to set National Ambient Air Quality Standards for six common air pollutants (Ozone, Particulate Matter, Carbon Monoxide, Nitrogen Oxides, Sulfur Dioxide, and Lead. Effects from the Blacksmith project on air quality are summarized from Ebert (2013b).

Affected Environment

Both Topography and Weather play critical roles in the distribution of emissions within the planning area. Steep, narrow canyons predominate in the planning area typically running in a West – East direction. Typically weather patterns in the area are characterized by upslope, up-canyon winds during the afternoon hours with down-slope, down-canyon winds in the night. General wind patterns are influenced by the high and low pressure gradients and predominately influence a southwest flow aloft along the ridges. Inversions are prominent in the planning area due to the narrow canyons and drainages. Dependent on where the smoke emissions are, as nighttime cooling occurs is where these emissions typically settle during the nighttime hours and disperse the following day as temperatures warm.

CLASS 1 AIRSHEDS

Two Wilderness Areas are located in the vicinity of the project area; the Granite Chief and Desolation Wilderness Areas. Granite Chief is located 7 miles East and Desolation East, Southeast. Desolation Wilderness is identified as a Class I airshed.

SENSITIVE AREAS

The following communities are located within a 20 mile radius of the project area:

- Foresthill (West, 8 miles)
- Georgetown (Southwest, 6 miles)
- Quintette (South, 4 miles)
- Volcanoville(South, 3 miles)

Other potential areas that smoke emissions may extend to include Auburn, CA; Truckee, CA and the Lake Tahoe Basin.

The following areas are recognized as sensitive areas due to their recreational opportunities in the general area. Recreational activities include camping, boating, hiking and hunting opportunities. These recreation sites see their highest use during the summer time with least visitation during the fall to winter months.

- French Meadows Reservoir (Northeast, 1 mile)
- Hellhole Reservoir (East, 2 miles)
- Stumpy Meadows Reservoir (South, 1 mile)
- Oxbow Reservoir (Adjacent to Planning Area)
- American River (Adjacent to Planning Area)
- Rubicon River (Adjacent to Planning Area)

NON-ATTAINMENT AREAS

The 1990 amendment of the Clean Air Act published the General Conformity Rule. It states that in federal non-attainment areas, before actions can be taken on federal lands that have the potential to emit pollutants to the atmosphere, a determination must be made that the emissions will not exceed a de minimis (threshold) level (tons per year). If the action exceeds the de minimis level, then a conformity determination is required which documents how the federal action will not 1) cause or contribute to any new violation of any standard in any area; 2) increase the frequency or severity of any existing violation of any standard in any area; or 3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. If the project emissions are below de minimis levels the project would be considered exempt from conformity determination with the State Implementation Plan (SIP).

Placer County is currently in attainment for 5 of 6 criteria pollutants. Eight hour Ozone is currently in Non-Attainment status. There are no published emission factors that isolate ozone. Standards have been set, though, for the ozone precursors such as hydrocarbons and oxides of nitrogen. Ozone is formed as a result of photochemical reactions involving two types of precursor pollutants: volatile organic compounds (VOC) and nitrogen oxides (NOx). VOC and NOx air pollutants are emitted by many types of sources, including on-road and off-road combustion engine vehicles, power plants, industrial facilities, gasoline stations, organic solvents, and consumer products.

Nonattainment areas are classified as marginal, moderate, serious, severe, or extreme areas depending on the magnitude of the highest 8-hour ozone design value for the monitoring sites in the nonattainment area. The Sacramento region is classified as ‘Severe’ as determined by the Environmental Protection Agency’s (EPA) “Green Book Nonattainment Areas For Criteria Pollutants” (http://www.epa.gov/oar/oaqps/greenbook/index.html). Threshold values for de minimis levels with a severe listing are less than 25 tons/year.

Environmental Consequences

Table 17 Emission Estimates from Harvesting Activities (Tons of Emissions)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
PM_{10}	1.15	0	0.24	0.95	1.24
CO	9.09	0	0.80	7.33	9.83
VOCs	1.13	0	0.25	0.94	1.22
NO_x	15.76	0	2.73	12.95	17.00

Table 18 Smoke Emissions Estimates from Prescribed Fire Activities (Tons of Emissions)

	Alternative 1	Alternative 2*	Alternative 3	Alternative 4	Alternative 5
PM10	204.52	403.76	108.96	175.37	203.44
CO	1715.17	3391.10	994.13	1460.35	1721.69
VOCs	88.67	175.16	48.77	75.83	88.49
NOx	85.87	169.98	53.44	72.64	86.90
***Alternative 2 is emission values are based on a wildland fire occurring in the proposed treatment units.**					

Alternative 2

Direct & Indirect Effects

Under this alternative, no increase in ozone precursors or PM10 emission levels would be produced from prescribed burning of activity generated fuels, harvest operations, or understory burning. Potential for substantial degradation of air quality from wildfire in the future as surface fuel deposition occurs would not be reduced. Alternative 2 will not provide any opportunities to reduce existing forest fuels and the hazard they pose in wildland fires. During the flaming phase of a catastrophic wildfire, air quality degradation can exceed Federal and State standards as far as 50 miles downwind. All things being equal, wildfire generally produces twice the emissions of prescribed fire due to increased consumption (Ottmar & Hessburg, 1998).

Cumulative Effects

Cumulative effects are not expected in with this alternative.

Alternatives 1, 3, 4 and 5

General conformity is the federal regulatory process for preventing major federal actions or projects from interfering with air quality planning goals. Conformity provisions ensure that federal funding and approval are given only to those activities and projects that are consistent with state air quality implementation plans (SIPs). Conformity with the SIP means that major federal actions will not cause new air quality violations, worsen existing violations, or delay timely attainment of the national ambient air quality standards (NAAQS).

General conformity requirements apply only if federal actions satisfy one of the following two conditions: (40 CFR 93.153)

- The action's direct and indirect emissions have the potential to exceed the de minimus threshold levels established for criteria pollutants in the rule. For a severe nonattainment area, the threshold level is 25 tons per year of VOC or NOx.

- The action's direct and indirect emissions of any criteria pollutant represent 10% or more of a nonattainment or maintenance area's total emissions inventory for that pollutant
- General Conformity is not required for the Blacksmith Ecological Restoration Project. The estimated emissions for mechanical thinning are below the 25 tons of emissions per year.

Generally conformity is not required for prescribed burn activities under 40 CFR 93.153 (i) (2). Prescribed burning activities are "presumed to conform" when conducted in accordance with a smoke management program (SMP) which meets the requirements of EPA's Interim Air Quality Policy on Wildland and Prescribed Fires or an equivalent replacement policy.

It is also anticipated that prescribed fire activities would be a multi-year process and typically occur during the time of year when air quality is less of a concern for increasing Ozone emission levels. Yearly emissions are anticipated below de minimus threshold values for NOx or VOC.

Direct & Indirect Effects

Short term effects to air quality during mechanical thinning activities include the generation of dust and exhaust from equipment used at the worksite. Logging trucks would add emissions driving from the landing to the mill. Impacts related to dust would be localized and emissions would be dispersed upwind from the project site by wind. Mitigation measures to reduce impacts include watering dirt roads to limit dispersion of fugitive dust.

Short term effects to air quality during prescribed burning include visual impacts of smoke production and its associated emissions which can be a public health concern when in heavy concentrations. It is anticipated that localized effects in the project area would include pooling of smoke during nighttime hours when inversions are present. Downwind impacts related to smoke may potentially occur in populated areas such as Foresthill and Georgetown.

Several mitigation measures are available to reduce the amount and duration of smoke emissions dependent on meteorological conditions. All action alternatives that include prescribed fire can manage for smoke emissions compared to Alternative 2. Managing smoke emissions on a wildfire is not feasible in many instances. Examples of mitigation measures include limiting the size of the burn, cut-off burn times, and mop-up of large fuels or areas generating smoke. These mitigations allow fuels to burn down during favorable weather conditions which transport and disperse smoke.

A reduction in the size, change in type and arrangement of fuels post treatment will reduce smoke emissions within the treatment units should a wildfire occur within or move into the treated areas. Finer fuels post treatment would consume faster emitting less smoke with minimal smoke generation as fuels would quickly consume.

Cumulative Effects

Emissions under this project would be cumulative to other projects in the area, but would comply with air quality regulations for the area.

Cultural Resources

Effects to Cultural Resources are summarized from Buckley (2013).

Affected Environment

There are many remnants of past cultures throughout the Eldorado National Forest (ENF). These cultural resources (also referred to as historic properties or archaeological sites) not only illustrate the centuries-old relationships between people and the land but they hold clues to past ecosystems and human interactions with them. Research indicates that human occupation of the north-central Sierra Nevada dates back to at least 7,000+ years ago, with the most intense use of the region occurring within the last 4,000 years (Jackson 1994). Up to the mid-1800s, the record of human use consists of the remains left by the original Native people and their descendants. Three ethnographic groups (northern Sierra Miwok, Nisenan or Southern Maidu, and Washoe) were known to utilize resources within the ENF. Use of the project vicinity was likely focused on seasonal acquisition of plant and animal resources for subsistence and raw materials. Trade likely played an important role as well. This wide range of land use and activities is documented by a variety of resource classes ranging from small lithic scatters to more complex assemblages and possible year-round villages. Site classes present within the project area include bedrock mortars, groundstone, lithic scatters, quarries, middens, trails, rockshelters, pitted petroglyphs, temporary and base camps. These resources have a higher probability of occurring on relatively flat ground and southern slopes, near springs and stream confluences, and near primary food sources such as oaks.

Trappers and explorers began penetrating into the Sierra Nevada foothills by the 1820s with exploration increasing in an effort to find a trans-Sierra route (Supernowicz, 1983). The California trail, opened in 1844 by Elisha Stevens, eventually became a major route used by miners entering California from the plains. A number of conflicting route descriptions of this mountain crossing exist and one spur may have led through the project area. Moses Schallenberger suggests a split of the Stevens Party at Donner Lake in November of 1844 with one group traveling south on the west shore of Lake Tahoe and then following the Rubicon River to the Middle Fork of the American River arriving near Sutter's Fort on December 13th. This was apparently the first trans-Sierrean crossing by

wagons in this region (Werner and Flaherty 1985). Sites associated with historic trails often include horse and oxen shoes, iron stained rocks, isolated debris scatters of cans and glass, and blazed trees.

Traditional uses of the area remained virtually unchanged until the Mexican-American War (1846-1848) and the Gold Rush. By 1849, the gold discovery in nearby Coloma ignited a rapid and unprecedented population expansion, as "forty-niners" rushed to the California gold country. By 1860 virtually all of the streams and drainages within Placer and El Dorado counties were tested and exploited for gold. According to Supernowicz (1983), many small dispersed camps developed around principal mining districts within the ENF. These camps were used for a few months or a year. A number of them were established on Ralston Ridge during initial exploration of the tertiary gravel deposits. The majority of these early mining ventures were transitory in nature and little remains of their physical locations. However, by the 1870s, a group of 13 men filed eighteen 20-acre plots in Long Canyon and Wallace Canyon (Werner and Flaherty 1985). Four of these men, Jerry Poland, Ebenezer Ramsey, W. Corcoran, and Seth Lamoney, mined in the area into the 1890s. Poland and Ramsey held claims that encompassed land within the project APE (Blacksmith Flat and Clydesdale mines) and were extracting gold through hydraulic mining. This method required a great deal of water as attested to by the numerous ditch systems crisscrossing the slopes and canyon sides. The opening of Ralston Divide Placer Mine and the Goggins Mine resulted in a mining resurgence between 1891 and 1930. Ralston's mine became the largest in the area, eventually encompassing 9600 acres of land and extending over a 14 mile square area (Werner and Flaherty 1985). Historic mining sites can occur wherever gold is present, and historic ditches, roads, and trails can traverse both steep slopes and level ground. Additionally, historic sites are not tied to permanent water sources, as prehistoric sites are, and therefore can occur almost anywhere without regards to slope or aspect (Supernowicz, 1983). Sites related to mining may include habitation areas, wooden flume and machinery parts, debris scatter of cans and glass, stamp mill pads, adits, shafts, prospect pits and trenches, ditches and trails.

While mining continued to be important in the project vicinity, other uses also developed near the turn-of- the-century. Sheep and Cattle grazing emerged in the 1870s and the project vicinity became seasonal destinations for hundreds, if not thousands, of domestic animals. Early logging ran the mines and provided milled timbers to flume the ditches. With the creation of the ENF in 1910, land management policies slowly began taking effect. Many ranger stations and fire lookouts inter-connected by telephone wire dotted the landscape by 1916. A 1916 ENF map depicts the Long Canyon Telephone line extending from Georgetown east to Quintette then north to Ralston Placer Mine, east to Lynchburg Ranger Station where it splits with one branch connecting through Zuver Mine to Devil Peak Lookout and the other branch connecting through Goggins Mine to Long Canyon Ranger Station. The material remains of these sites often consist of corrals, privies, rock lined pathways, can scatters, spiked lookout trees, and decaying milled timbers.

Travel access into the area greatly improved in the 1930s through the efforts of the Civilian Conservation Corps (CCC). By 1933, a CCC camp was established at Goggins Mine and construction

of roads including Ralston Road was in full swing. The construction of Hell Hole and Stumpy Meadows Reservoirs in the 1950s substantially increased recreational use which in turn prompted the development of recreational facilities still in use today.

Environmental Consequences

Alternative 2

Direct and Indirect Effects

Alternative 2 will have no direct effect on historic properties as no activities would occur. Failure to treat the project area will not alleviate the hazardous fuels conditions, leaving cultural resources at risk from exposure to damage from wildfire. A fire in conjunction with associated suppression efforts could adversely affect the majority of the archaeological resources within the project boundary, especially those with wooden components. Not only can the contextual data be lost but high temperatures also affect the ability to chemically source lithic material, thereby affecting archaeological study of prehistoric trade patterns. Other indirect effects from wildfire include increased access to and visibility of cultural resources that often results in looting and vandalism as well as increased surface runoff and erosion, tree mortality, and increased rodent burrowing.

Cumulative Effects

No cumulative effects are expected with this alternative.

Alternatives 1, 3, 4, and 5

Direct and Indirect Effects

Activities associated with the action alternatives will comply with Section 106 of the National Historic Preservation Act of 1966, as amended in accordance with provisions of the Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), the California State Historic Preservation Officer, the Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forest of the Pacific Southwest Region (Regional PA 2013).

Mechanical activities including bulldozer fireline construction, mastication, log skidding, and roadwork are the activities that have the highest potential to adversely affect sites. Potential direct effects to at-risk cultural properties from mechanical activities could include displacement and/or obliteration of surface and subsurface deposits. Surface artifact scatters, such as cans and bottles, are easily displaced by bulldozers and log skidding. Activities such as hand thinning, planting and herbicide present a low risk to cultural resources because any ground disturbance would be minimal.

Prescribed fire and associated hand line construction could also negatively impact some sites depending on site characteristics. Prescribed fire presents a risk for sites that could be consumed or

that could be damaged by smoke. Low intensity prescribed fire generally is of low risk for damage to most Native American sites. Subsurface sites, such as middens have minimal risk of damage from prescribed fire due to the insulation provided by the soil as long as surface temperatures and fire duration are not excessive. However, features such as bedrock milling areas and pitted petroglyphs are at higher risk where fuel loading is heavy or where fallen limbs or snags can ignite and smolder near or on the rock surface, causing blackening and cracking of the bedrock surface. The ability to date lithic material can also be compromised by exposure to extreme heat. Historic sites such as structural remains are typically at higher risk for damage from prescribed burning operations as they are often constructed of organic, woody materials that are readily consumed by fire.

Project treatments under Alternatives 1, 3, 4, and 5 could result in a direct effect on plant species important to Native American gatherers. Given the lack of knowledge regarding abundance and distribution of these plant species of interest across the project area, survey and consultation efforts were focused on identifying these values.

Design criteria to protect cultural resources during project implantation have been incorporated into the design of this project. By following these procedures, there will be no direct effect to historic properties from implementing Alternative 1 or action alternatives. In the event areas of interest are identified by local Native American tribes, management requirements and mitigation measures are in place to allow for the protection of these traditional cultural resources

Although there remains a small potential for adverse effects to cultural resources from project activities, project activities also provide direct benefits to site preservation and management through treatment of select sites to reduce fuel loading within site boundaries and indirectly through reduced risk for loss from subsequent wildfires. Additionally, the removal of extensive brush, undergrowth and heavy tree thickets within and adjacent to cultural resource sites will enhance the setting by restoring the characteristics of the original landscape, increasing opportunities for interpretation in the future.

Cumulative Effects

The current project would use a mixture of flag and avoid, and treatment to better protect cultural sites from activities and from potential loss to wildfire, and therefore would not contribute to a cumulative effect. No future projects are currently proposed in the analysis area, however, it is anticipated that this and future project management activities will not affect cultural resources to a significant degree as these projects will be subject to NHPA Section 106 compliance and will include protection measures in the design and implementation of these projects.

Social and Economic

Social and economic effects are summarized from Errington (2013a and b). The costs and appraised values used in this analysis are based upon the predicted volumes and values for the entire project

based on the percentage available for analysis. These estimates may vary somewhat as the final cruise volumes and sampling errors are refined. Recognizing the difficulty and inherent inaccuracies of making specific project or alternative cost estimates, the following costs are considered to be reasonable estimates for the Blacksmith Ecological Restoration Project. This information is based upon experience related to the planning, preparation and implementation of several dozen understory thinning/fuels reduction projects over the last 18 years on the Pacific and Georgetown Ranger Districts.

The Forest Service appraisal process attempts to identify or estimate what the fair market value of the standing timber (stumpage) is on a given project. In order to establish a reasonable or "accurate" estimate of the fair market stumpage value on a specific project, the value of the logs delivered to a mill and the logging costs associated with that delivery must be estimated in the appraisal. Because of the importance of accurate appraisals, the appraisal process has been standardized by Forest Service Region. Although the process is standardized, local, sale specific data is used in each appraisal.

As stated above, the value to a mill of a delivered log must be determined. This value is termed the "log pond value". The pond values used in Forest Service appraisals do not represent the pond value for a specific sawmill or timber sale, rather the pond values used in our appraisals are region-wide prices at a given point in time for an "average" log of a particular species. The value of a log delivered to a mill is a composite of the log delivered price information provided by the Oregon Log Market and Pacific Rim Wood Market Report.

Average pond values are affected by broad economic conditions such as lumber supply and demand trends, such as new housing starts or amount of imported timber. The average log pond value for the Blacksmith Project is project specific in that the pond value reflects the average characteristics of the trees to be harvested, such as size, species and general quality of the individual logs.

The estimated logging costs associated with the harvesting of the timber is also estimated. Logging costs for the most part are based upon regional average production, equipment use rates and salary rates. Equipment production rates are regional averages, but because production rates are significantly affected by volumes logged on a per acre basis and the average size of the individual trees, the regional averages are adjusted for individual sales based upon the unique characteristics that may be present. It is this exercise that "localizes" the regional averages to the local project. This is the heart of the appraisal procedure and really the only portion of the process wherein the appraiser uses individual judgment and experience.

The sale appraiser must consider and estimate the myriad of logging costs that will affect stumpage unique to the individual project. A few of the typical items to be considered include:

- Cost of cutting, skidding, de-limbing, bucking, loading and hauling the logs to the nearest mill capable of manufacturing the logs;

- Costs associated with specialized logging systems such as cut-to-length;
- Costs associated with the protection of improvements, such as moving/repairing fences, or directional falling to avoid improvements, such as power lines or roads;
- Costs of performing required slash and erosion work;
- Costs of landing, temporary road, and permanent road construction or re-construction;
- Costs of road maintenance, such as grading, watering and ditch cleaning;
- Payments to the Forest Service to provide engineering services or to perform surface replacement, and pile burning;
- Yield tax payments to the CA Franchise Tax Board.

Timber is sold competitively by bidders submitting a secret, sealed bid. Although competition between/among potential purchasers is fairly weak because of the significant number of mill closures in California, the Stewardship Contracting features have encouraged some renewed level of competition locally. Contracts are generally awarded to the highest bidder, although stewardship contracts allow for non-price considerations as well and may not always be awarded to the bidder who bid the most for the timber or the least for the stewardship projects.

The cost of the stewardship work is a bid item and the Economic Analysis completed for this project used adjusted costs from similar, fairly recent projects on the Pacific and Georgetown Ranger Districts. Stewardship work items that are biddable have been experiencing a downward trend since the inception of stewardship contracting on the Eldorado NF, however it appears as though bid prices for stewardship work has now generally stabilized and this downward trend is no longer present.

Table 19 Estimated Cost for Project Activities

Activities	**Estimated Cost/ac**
Biomass Removal during commercial harvest	$120.00/ac
Brush Cut and Machine Piling	$209.00/ac
Hand clearing around large pine prior to Burning Machine Piles	$32.00/ac
Machine Pile Burning	1,985 @ $50.00/ac
Lopping and Scattering Slash in Skyline Units	$25.00/ac
Grapple Piling in Various Units	$300.00/ac
Grapple Pile Burning	$50.00/ac
Mastication as a Slash Treatment	$475.00/ac
Planting	$250.00/ac
Herbicide Treatment After Planting	$275.00/ac
Herbicide (80 acres of noxious weeds	$275.00/ac/treatment)[3]treatments needed

Activities	Estimated Cost/ac
Cutting and In-Woods Chipping	$1,995.00
Cutting and Removal to Landings for non-commercial material only	$741.00
Cutting and Tractor/Grapple Piling in the Woods	$632.00
Mastication in the Woods With Some Tractor Piling	$1,056.00

Sawmill and logging full-time equivalent (FTE) employment related conversion factors used in this analysis are adopted from "The Forest Products Economic Impact Study Current Conditions and Issues (Conway, 1994) as cited in "Implications of Working Forest Impacts on Jobs and Local Economies by Lippke and Mason, 2005). The conversion factors used for other activities, such as tractor piling, herbicide treatment and mastication are estimated based upon labor intensity associated with the activities. A labor cost of $30,000 is assumed to be equivalent to 1 FTE.

Based upon the Lippke and Mason paper, it is assumed that each million board feet of timber harvested directly supports the equivalent of 7.7 year-round jobs in the logging and sawmill industries. In addition, for every direct industry job another 4.2 indirect jobs were created. Therefore, 32.3 indirect jobs are linked to each million board feet of timber harvest. Direct employment is very sensitive to harvest volume whereas indirect jobs are not as immediately sensitive to harvest volume fluctuations. As income is recycled from direct jobs to indirect jobs and via consumption to other support services within the community the number of indirect jobs can be quite high. Additional jobs are also produced by profits from harvesting and from mills where profits are reinvested by forest landowners and timber companies.

Other, significant employment related conversion factors potentially relevant to this project are assumed to be:

- biomass removal to landing @ 1 job/1,000 ac
- brush cut/machine piling logging slash @ 1 job/1,000 ac
- hand clearing around large pine trees @ 1 job/800 ac
- machine/grapple pile burning3 logging slash
- lop and scat logging slash @ 1 job/1,000 ac
- grapple piling logging slash@ 1 job 1,000 ac
- mastication brush and small trees @ 1 job/500 ac
- planting in site prepared areas @ 1 job/200 ac
- herbicide sprouting brush and noxious weeds @ 1 job/250 ac

Affected Environment

The Blacksmith project is located primarily within Placer County – near the small (pop. 1,500) rural community of Forest Hill, CA, located approximately 10 miles west, northwest of the project area. Placer County encompasses 1,506 square miles and is located 80 miles northeast of San Francisco, California. Placer County is part of the Greater Sacramento Metro Region (GSMR), which also includes the Counties of El Dorado, Sacramento, Sutter, Yolo, and Yuba. The largest city in Placer County is Roseville and the County Seat is in Auburn. There is also a minor portion of the project activities occurring in El Dorado County (approximately 10 acres).

Approximately 54,000 acres of the 600,000 acre Eldorado National Forest (ENF) and 287,000 acres of the 871,000 acre Tahoe National Forest are located in Placer County. Private lands within and adjacent to the boundary of the project area are primarily owned by timber-land management corporations consisting of Sierra Pacific Industry, Inc. (SPI) and Simorg West Forests, LLC.

The socio-economic environment affected by the Blacksmith project is primarily associated with the benefits/costs and opportunities that are present and of value, either monetarily or spiritually, to the public. The socio-economic environment of the Blacksmith project can be described in a multitude of ways, however for purposes of this analysis, the local socio-economic environment consisting of Placer County and the Greater Sacramento Regional area is considered to be the affected environment and is briefly described in this section.

Local Economy

Prior to the recent economic downturn, Placer County's economy had seen high levels of job growth and significant increases in taxable sales during the last decade of the 20th century and most of the first decade of the 21st century. Like most areas of the country, economic conditions in Placer County have suffered during the recent years, but its strong base and rather diversified industry composition have mitigated some of the potential effects of the recession. The County is specialized in six sectors (Construction; Financial Activities; Leisure & Hospitality; Trade, Transportation, & Utilities; Educational & Health Services; and Other Services) and has continued to encourage start-ups and relocations of businesses within these and other sectors.

Placer County is the location of prominent businesses such as Hewlett Packard, Oracle Corporation, Ace Hardware, and PRIDE Industries. Placer County has developed a number of high technology industry clusters since 2000. These include biotechnology/bioscience, hardware, medical device manufacturers, networking/system integration, and software. The software sector, in particular, has grown substantially since the early 2000's with many small firms joining Oracle Corporation in South Placer County. The economy of Placer County is concentrated in the services sector, while retail trade, finance, insurance, real estate, construction, and government and public administration also provide

significant contributions. The top-ten employers in Placer County all have an employment base of over 1,000 employees, with 6 of the top ten entities employing more than 2,000 full-time employees.

Forest Products

The forest products industry provides about 227,000 jobs in California compared to approximately 16 million total employment statewide. The forest products industry represents about 1.4% of the overall California employment at the state-wide level. However, the forest products industry is quite important to more local economies in northern California.

In 2009, there were approximately 100 employees directly working in the logging/mining industry in Placer County. This number of employees has remained relatively unchanged throughout 1999-2009 for Placer County. Within the GSMA during the 1999-20009 period, there was a 27% decline in employment in the logging and mining industry with an estimated 800 individuals employed in the industry in 2009.

Over the past decade three large wood products manufacturing facilities in the GSMR have closed. One of these, the Sierra Pacific Industries (SPI) sawmill in Camino, El Dorado County is still functional and could re-open if log supplies were available and the lumber market improved. Within Placer County, logging and mining business related activity decreased nearly 18% during the 1999-2009 period.

At the present time, the SPI sawmill in Lincoln is the only significant wood products manufacturing facility operating within the GSMR. The SPI sawmill in Lincoln is among the largest sawmills on the west coast and currently has approximately 315 employees and ranks about 13th in terms of number of workers employed by the private sector in Placer County.

During the last decade the ENF has annually offered for sale approximately 20 million board feet of timber. This volume was bought by Sierra Pacific Industries or other purchasers, and primarily processed at the Lincoln, CA sawmill. The Lincoln mill sawlog capacity is 170 million board feet/year and annually relies on purchasing 20% (34 million boardfeet) of timber from national forest timber sales to sustain its operations.

Social and Economic Consequences

Alternative 2

Direct and Indirect Effects

No harvesting of trees or any associated fuel treatments would be conducted. No road work would be completed. No volume would be provided to local mills and no fuel treatment investments would occur. The estimated $400,000.00 costs associated with the completed field layout, NEPA work thru Draft EIS and some timber marking would be an expenditure with no associated accomplishments.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternative 1

Direct and Indirect Effects

National Forest management directly affects the socioeconomic environment of the Sierra Nevada through employment and income derived from resource extraction, production and use. Timber harvest from National Forest System lands provides a flow of products to area industries. Direct and indirect employment is produced by the jobs associated with the harvest and processing of timber. In terms of gross revenue, timber is one of the Sierra Nevada's most valuable products. Timber harvest activities have commonly been associated with the jobs they create in rural communities.

The majority of timber production in the Sierra Nevada now comes from private harvests. Timber harvesting on private lands accounts for 67-90 percent of total timber harvests in the Sierra Nevada. A decrease in available timber harvest continues to result in mill closings, lost jobs, and decreasing potential financial capital.

Timber volume associated with the project would help satisfy the demand by local mills for timber supplies. Funds received from the sale of timber products would be used to finance or partially off-set the need for the use of appropriated funds or retained receipts to accomplish the proposed fuel treatments. The proposed treatments would also provide employment to local business directly and indirectly associated with harvest activities, road reconstruction, fuels work and associated equipment use and maintenance.

Although the Eldorado NF has no annual timber sale volume targets, the Forest has attempted to offer about 40,000 ccf (hundred cubic ft) of timber/year which is equivalent to the timber volume that the local mill has on average purchased and/or processed from the ENF over the last decade.

A total of 24,237 ccf of timber would be removed under Alternative 1. This represents approximately 60% of the 40 ccf of Eldorado NF's average timber volume sold each year. The funds available from the harvest of 24,237 ccf of timber that would be available for fuels treatment would be approximately $946,200.00 if the sale were sold under the current, relatively depressed timber market conditions. In addition, Alternative 1 would reconstruct approximately 37 miles of road at an estimated cost of $296,000.00.

The $946,200.00 in estimated timber revenues would accomplish about 82% of the $1,160,605.00 of the direct, fuels treatment costs associated with the commercial harvest units. No funds would be

available to accomplish any of the $2,437,905.00 of treatments that are not associated with the commercial harvest units (i.e. work in non-commercial treatment units).

This alternative would generate approximately 494 direct and 9 indirect jobs related to the harvest and post-harvest fuels and restoration treatments.

Cumulative Effects

Effects for increased economic activity with this project would be cumulative to other projects ongoing and planned on the forest.

Alternative 3

Direct and Indirect Effects

No timber volume would be commercially harvested under this alternative. Brush cutting and machine piling would be utilized to accomplish the primary fuels treatment. All funding would need to come from appropriated dollars or from the forest retained receipt fund pool. The direct costs of implementing this alternative would be approximately $1,523,988.00. An estimated 10 miles of road reconstruction would be needed for this alternative at an additional cost of $80,000.00 Additional costs of $853,652.00 are associated with other treatment opportunities in this Alternative.

This alternative would generate approximately 6 direct and 2 indirect jobs associated with the fuels and restoration treatments.

Cumulative Effects

Effects for increased economic activity with this project would be cumulative to other projects ongoing and planned on the forest.

Alternative 4

Direct and Indirect Effects

A total of 18,977 ccf of timber would be removed under this Alternative. This represents approximately 47% of the 40,000 ccf of Eldorado NF's average timber volume sold each year. Funds for fuels treatment available from the harvest of 18,977 ccf of timber would be approximately $635,800.00 if the sale were sold under the depressed timber market conditions. In addition, Alternative 4 would reconstruct approximately 33 miles of road at an estimated cost of $224,000.00.

The $635,800.00 in estimated timber revenues would accomplish about 62% of the $1,027,527.00 of other costs directly associated with the commercial harvest units. No funds would be available to accomplish any of the $2,374,913.00 of treatment opportunities that are not associated with the commercial harvest units.

This alternative would generate approximately 388 direct and 9 indirect jobs related to the harvest and post-harvest fuels and restoration treatments.

Cumulative Effects

Effects for increased economic activity with this project would be cumulative to other projects ongoing and planned on the forest.

Alternative 5

Direct and Indirect Effects

Compared to the other action Alternatives, Alternative 5 commercially thins more acreage and would generally thin the treated acres more intensively. The analysis for Alternative 5 reflects the fact that more acres are being treated in this alternative, however because no sample cruise was done for this alternative, the table does not reflect an increase in the total volume or volume thinned per acre. The marking prescription implementing this alternative would likely increase the intensity of the thinning, however no sample mark was attempted thus no reliable prediction of the amount of additional volume and value per acre is available. Therefore effects should be viewed as a conservative estimate of the minimum volumes, values and FTE jobs likely to be experienced. An estimated 25,944 ccf of timber would be harvested under this alternative. This represents approximately 65% of the 40,000 ccf of Eldorado NF's average timber volume sold each year. The funds available from the harvest of 25,944 ccf of timber that would be available for fuels treatment would be approximately $1,012,860.00 if the sale were sold under the current, relatively depressed timber market conditions. In addition, Alternative 5 would reconstruct approximately 39 miles of road at an estimated cost of $296,000.00.

The $1,012,860.00 in estimated timber revenues would accomplish about 82% of the $1,232,414.00 of the direct, fuels treatment costs associated with the commercial harvest units. No funds would be available to accomplish any of the $2,447,597.00 of other treatment opportunities that are not associated with the commercial harvest units.

This alternative would generate approximately 529 direct and 9 indirect jobs related to the harvest and post-harvest fuels and restoration treatments.

Cumulative Effects

Effects for increased economic activity with this project would be cumulative to other projects ongoing and planned on the forest.

Human Health and Safety

Effects to human health from proposed herbicides are summarized from the Risk Assessment for the Blacksmith Project (Walsh 2013b). This risk assessment examines the potential health effects on all groups of people who might be exposed to any of the pesticides that are proposed in this project. In essence, this pesticide risk assessment consists of comparing doses that people may get from applying the pesticide (worker doses) or from being near and application site (public doses) with the U.S. Environmental Protection Agency's (U.S. EPA) established Reference Doses (RfD), a level of exposure that result in no adverse effect over a lifetime or chronic exposures. For each type of dose assumed for workers and the public, a hazard quotient (HQ) was computed by dividing the dose by the RfD. In general, if HQ is less than or equal to 1, the risk of effects is considered negligible. Because HQ values are based on RfDs, which are thresholds for cumulative exposure, they consider acute exposures. This aspect is discussed below in the evaluation of possible effects. One of the primary uses of a risk assessment is risk management. Decision makers can use the risk assessment to identify those herbicides, application methods, or exposure rates that pose the greatest risks to workers and the public.

Alternative 2

Direct and Indirect Effects

Proposed activities with the Blacksmith Project would not be implemented with this alternative; therefore there would be no potential risk of negative effects from herbicide application.

Cumulative Effects

Cumulative effects would not occur with this alternative.

Alternative 1, 3, 4 and 5

Aminopyralid

Given the low hazard quotients for both general occupational exposures as well as accidental exposures, the results imply that long-term employment applying this herbicide can be accomplished without toxic effects. For the general public acute/accidental scenarios, and the long-term/chronic exposures hazard quotients were all well below a level of concern indicating little hazard to the general public from application of this pesticide.

Glyphosate

Given the low hazard quotients for both general occupational exposures as well as accidental exposures, the results imply that long-term employment applying this herbicide can be accomplished without toxic effects. For general public no exposure scenario approached a level of concern for the proposed application rate. Safety precautions built into the design criteria have been designed to further minimize potential risks.

Impurities and Metabolites

Virtually no chemical synthesis yields a totally pure product. Technical grade herbicides, as with other technical grade products, contain some impurities. To some extent, concern for impurities in technical grade herbicides is reduced by the fact that existing toxicity studies of these herbicides were conducted using technical grade products. Thus, if toxic impurities are present in a technical grade product, there effects are reflected in the toxicity measurements. An exception to this general rule involves carcinogens, most of which are presumed to pose risks in any concentrations. In the case of the herbicides under consideration, carcinogen impurities are:

- Ethylene oxide potentially in surfactant
- 1,4 dioxane potentially in surfactant

Risk of cancer from exposure to ethylene oxide is considered negligible for occupationally exposed individuals, based on a standard of acceptable risk of 1 in 1 million (USDA, 2003). Risks from exposure to ethylene oxide are considered acceptable (USDA 2003), given the conservative assumptions about exposure. Risks of cancer from the exposure to 1,4-dioxane are considered negligible for occupationally exposed individuals, based on a standard of acceptable risk of 1 in 1 million (Borrecco and Neisess 1991). Accordingly, risks from ethylene oxide and 1,4-dioxane exposures are considered acceptable and will not be further analyzed or discussed further.

Additives

Syl-Tac® and Hasten® both have a potential to cause slight skin and eye irritation.

Colorfast® Purple contains a dye, Basic Violet 3 or Gentian Violet, which is considered a potential carcinogen. Use of the dye would be expected to reduce public exposure to the herbicide and adjuvant used because the public would be alerted to the presence of treated vegetation.

Hi-Light® Blue is considered virtually non-toxic to humans. It is mildly irritating to the skin and eyes.

Synergistic Effects

Based on the very low exposure rates estimated for this project with the herbicides individually or with the herbicides combined, any synergistic or additive effects are expected to be insignificant. Combining HQs for the two herbicides proposed for use did not indicate any increased areas of risk for either worker or public safety and health from those reported individually for each pesticide. While it is plausible that for Glyphosate some mechanisms of interaction could occur with other chemicals, it would likely be relevant only at very high doses, substantially above proposed exposure levels (SERA, 2011). No information is available on the interactions of aminopyralid with other compounds and most inferences that can be made are speculative.

Surfactants by nature are intended to increase the effect of pesticide by increasing the amount of pesticide that is in contact with the target. Current data indicates a lack of synergistic effects between

surfactants and pesticides. Increased absorption would require physical effect to the skin which is not likely to result from the addition of non-ionic surfactants (USDA, 2002; and USDA, 2003).

Cumulative Effects

Cumulative effects may involve either repeated exposures to an individual agent or simultaneous exposures to the agent of concern and other agents that may cause the same effect or effects by the same or a similar mode of action. The most important connected action in the use of aminopyralid and glyphosate involves the use of surfactants with each chemical. As discussed above, potential of synergistic effects are not likely.

It is possible and even likely that some individuals will be exposed to multiple sources of herbicides as a result of Forest Service programs, or that individuals could be exposed to additional sources of exposure including use of herbicide on adjacent private timberlands or home use by a worker or member of the general public. There is no basis for asserting that cumulative adverse effects associated with longer-term or repeated exposures to aminopyralid are plausible (SERA, 2007). EPA is currently requiring additional tests on glyphosate to assess the potential of glyphosate to cause endocrine effects. Depending on the results of these tests, exposure to other agents which affect endocrine function could be associated with cumulative effects (SERA, 2011).

While it is possible that workers and members of the public could travel to other areas and be exposed to pesticides, pesticide use near the project area is more likely to be a cumulative exposure. Additional sources of exposure can also occur from herbicide use on National Forest System lands. Past use on Region 5 Forests of the herbicides proposed are displayed below. Either R-11 surfactant or Syl-Tac is assumed to have been used in all glyphosate applications. Syl-Tac may have been used in some applications. Glyphosate use has increased over the past couple years on the Eldorado with implementation of release work on the Fred's Fire Restoration project. Aminopyralid is a new chemical on the Eldorado, and is replacing previous Clopyralid use which had been used on 167 acres in 2011 and 314 acres in 2010 for invasive plants. It is expected that the number of acres treated in the next few years on the Eldorado National Forest will continue to remain stable as budgets and work on planned projects is not expected to drastically change. There is the potential for exposure from projects on the Eldorado National Forest involving the herbicides proposed for use on this project. They include the Weed Eradication and Control project, the Tobacco Gulch Project, the 2-Chaix project, the Big Grizzly Project and Fred's Fire Reforestation.

This risk assessment and those used to develop this risk assessment specifically consider the effect of repeated exposure in that the chronic (derived) RfD is used as an index of acceptable exposure. Repeated exposure to levels below the toxic threshold does not appear to be associated with cumulative toxic effects. Since these herbicides persist in the environment for a relatively short time

(generally less than 1 year), do not bioaccumulate, and are rapidly eliminated from the body, doses from re-treatments in subsequent years are not expected to have additive effects.

Climate Change

Affected Environment

While there is a great deal of uncertainty in the future climate that will be experienced in the area and how current and future events will interact to affect vegetation resources, climate change trends and projections for the Eldorado National Forest were examined in Mallek and Safford (2010). In general it is expected that temperatures will increase, including an increase in nighttime minimum temperatures. It is uncertain whether or not there would be more or less precipitation annually, but it is anticipated that summers will be drier and that more precipitation will come in the form of rain rather than snow. It is projected that forest types would migrate to higher elevations as higher temperatures and longer growing seasons make those areas suitable for colonization and survival. For this project area that means that given time and ability to move, the mixed conifer forests, pine types and oak types would shift upward in elevation. Fire intensity and severity has been increasing in this area and is anticipated to continue to increase under climate change scenarios, which would affect future stand structure and species mixes. Large areas of uncharacteristically severe fire may shift ecosystems into less desirable states that may persist for long periods with the added influence of climate change on those trajectories.

Diameter growth in the Sierra Nevada conifers is positively correlated with winter precipitation and to a lesser extent, summer air temperature (Battles et al. 2009; Robards, 2009). Some increase in vegetation productivity, given adequate available moisture could increase tree growth for some species (Hannah et al, 2009). Other species may have decreased growth (Chen et al. 2010). Under wetter climates increased carbon storage with increased vegetation productivity could be limited by greater losses to wildfire. Under drier climate scenarios carbon storage could be limited and vegetation productivity (Lenihan et al, 2006; Shaw et al, 2009). Battles et al. (2006) projected conifer tree growth would be reduced and could lead to substantial decreases in tree survival in El Dorado County.

Forest pests including native and invasive species may have competitive advantages for expanding their ranges and can become very destructive when forests are stressed by extreme weather and climatic changes. Climate change will likely favor insects with multiple generations in each year. This could increase insect pests and add new insect pests to this area (Trumble, and Butler, 2009). Many species in the southwestern United States and Mexico are currently limited by climate rather than host availability, suggesting a high potential for range expansion northward (Bentz et al., 2010). Rising winter temperature could also make conditions more favorable for pitch canker resulting in increased disease severity (Battles et al. 2006).

The major impact to terrestrial wildlife will most likely be from changes in the vegetation community. According to the California State Wildlife Action Plan (2007), climate change effects will be especially disruptive in the Sierra Nevada, primarily because drier summers may increase fire frequency and intensity, reduce sierra snowpack, and result in earlier snowmelt. The action plans states concern for species within the Sierra Nevada because of the addition of urbanization pressure causing the remaining natural areas to shrink and the gaps between habitats to grow. In addition to the loss of riparian associated vegetation, the possible increased gaps between habitats due to urbanization, fire and climate change make habitat connectivity to allow adaptive migration even more important. "As climate change shifts annual average temperatures along the elevation gradient, as fire reshapes plant communities, and as stream flow regimes change, habitats and wildlife populations will be substantially affected. So far, very little research has evaluated the consequences of projected climate change on species at risk in the Sierra …" (UCD Wildlife Health Center 2007).

Sensitive species will be impacted by these climate changes shifts, although consequences for species are uncertain. Climate change could lead to changes in sensitive species habitat location, quality, and quantity. Much of the habitat for late seral, old forest dependent species will be even more restricted to these north facing slopes and protected canyons; adding to further fragmentation of habitat. The proposed project reduces the higher tree density, but should increase old forest characteristics like average snag and downed log numbers in the short-term. It increases the resiliency of these stands to withstand the increased potential removal through the increased fire frequency predicted with climate change. This increased resiliency should make these stands more sustainable and allow for development of high tree densities and canopy covers that provide old forest characteristics in the long-term.

Sensitive species such as goshawks and marten may find their habitat more limited or shifted higher in elevation. With warmer temperatures, alpine and subalpine communities will shrink by 40-50% by mid-century, which will mostly impact marten and wolverine. Most common prey species should move with shifting habitat such as rodents, reptiles and small birds. It is more likely that changes in habitat quality and quantity will influence sensitive species than changes in prey availability as a result of climate change.

Environmental Effects

Alternative 2

With projected climate change trajectories, stresses on currently unsustainable stand structures and species compositions including projections for more severe drought and larger, more severe fires are expected to be exacerbated. Strategic placement of treatments across the landscape would not take place and therefore the likelihood of unacceptably large, high intensity fire would not be reduced. With no action large areas of uncharacteristically severe fire may shift ecosystems into less desirable states that may persist for longer periods. Even if these systems are able to regrow trees after large scale disturbance, stands may be more vulnerable to future fires. Loss of tree reproduction may become

more common since compared to overstory trees are likely to be more sensitive to environmental changes (van Mantgem et. al, 2006).

Alternative 1

Strategic placement of treatments across the landscape using a combination of treatments including prescribed fire is expected to reduce the likelihood of unacceptably large, high intensity fire for the short term and to begin to shift disturbance regimes toward patterns that are more consistent with how ecosystems evolved, promoting resilience to stressors such as climate change. Many of the proposed treatments are designed to meet an initial phase of an integrated landscape treatment strategy and are primarily designed to reduce fire hazard in strategic areas. Treated area along with vegetation directly adjacent to treated areas would be expect to be more resistant should temperature increase and longer fire seasons occur as a result of climate change. Some treatments would push species composition and structure to a condition where stands would be representative of reference stand structures and resilient under the foreseeable climate; however for the majority of the treatments, thinning and burning intensities are not expected to be sufficient to provide for resilience with this project for a timescale that would impact the very long term effects of climate change without future follow-up treatments. It is expected that treatment will reduce the potential for carbon loss in treated stands, as sequestering carbon in these forests it appears that low density forest, dominated by large, fire resistant pines, may be a desired stand structure for stabilizing tree-based carbon stocks in wildfire prone forests (Hurteau and North, 2009).

The EPA and the USFS has established national policy goals to take actions to improve the resiliency of both watershed and riparian floodplain ecosystems in response to predicted climate change impacts. As it relates to hydrology, the BMPs described previously in this document are designed to address potential direct and indirect sources of accelerated runoff and erosion, within the current climatic regime. In regards to cumulative watershed effects, climate change predictions add even more urgency to ensuring that the stream channel networks are maintained in stable geomorphic condition and are well connected to adjacent floodplains. Channels that are maintained (or restored) in a healthy state of dynamic equilibrium in terms of geomorphic/floodplain function, will be more resilient to adapting to climate change impacts, and maintaining high quality function in terms of water quality and aquatic and riparian habitat. Channels within the Blacksmith project area are currently considered to be resilient to climate change effects, and the actions proposed under this project are not expected to contribute to channel destabilization.

Increasing temperatures and changes in precipitation with climate change will impact both ecosystem structure and ecosystem processes. Viability of a species is dependent on the availability of suitable habitat. Animal species respond to climate variability in the short term through shifts in geographic range (migration) when suitable habitat is not available in the former range. Mortality and population extirpation in parts of a species' former range often occur. Over time, extirpation and colonization events cumulatively result in shifts of the species' distribution range (Davis and Shaw 2001, Delcourt

and Delcourt 1991). Land-use changes, development, and introduction of invasive species often impede the ability of species to respond to climate change adaptively resulting in small population sizes and isolation of populations as a result impede gene flow (Joyce et al, in press).

Vegetation treatments such as those proposed in this project increase the resiliency of the current habitat within the area impacted by the project for two reasons: 1) they reduce the potential for stand replacing fire within treatments and over the landscape including protected sensitive species areas (PACs) and 2) they improve stand health by promoting trees species that are adapted to hotter, drier summers and increased fire frequency (pines and hardwoods). Landscape and habitat resiliency is better met under Alternatives 1 to the large area treated and the longer lasting vegetation changes from treatments. These treatments may delay some of the immediate impacts to species especially from fire, and allow them to adjust slowly with adjusting habitat by preserving their currently located, possibly unsustainable habitat. By helping retain older forest dense habitats that sustain nesting and reproduction (PACs) in pockets protected by treatment units; these treatments are creating a resiliency for old forest habitat.

Experts suggest that land managers manage current habitat as a reservoir until suitable habitat can be established elsewhere (Hansen et al 2001). By retaining structure and characteristics suitable to foraging and dispersal, these treatment areas can still be considered suitable connective habitat to suitable high quality habitat. Because many of the late seral species habitat are located in protected drainages, where habitat is not expected to change, some of their habitat may not shift. This project and its various action alternatives would likely protect that habitat and the creation of future habitat in those areas from the climate changes threats.

While climate change may pose a threat to some of the sensitive species within the forest boundary, this project will benefit most species through an increase in the resiliency of the current habitat. For Alternatives 1 and 5 the BE determines the project may result in loss of occupied spotted owl sites, and it is possible that subtle factors that reduce population density (increasing nearest-neighbor distances) or reduce vital rates may incrementally increase the uncertainties associated with successful dispersal and mate finding and thereby increase the risk to population persistence. If this project reduces habitat quality to the point that it decreases the number of occupied sites or the productivity of sites, the likelihood of sensitive species successfully dispersing and occupying future available habitat becomes more uncertain. This would add to the adverse effects of climate change upon the species even if habitat patches are better retained.

Alternative 3

Treatment would not begin to shift disturbance regimes toward patterns that are more consistent with how ecosystems evolved, as thinning and burning intensities are not expected to be sufficient to

provide for long term resilience, leaving stands less resilient to stressors which are expected to be exacerbated with climate change.

Alternative 4

Strategic placement of treatments across the landscape using a combination of treatments including prescribed fire is expected to reduce the likelihood of unacceptably large, high intensity fire for the short term and to begin to shift disturbance regimes toward patterns that are more consistent with how ecosystems evolved, promoting resilience to stressors such as climate change. Benefits for increased long term resilience, however would be reduced from Alternative 1 since fewer of the proposed treatments designed to push species composition and structure to a condition where stands would be representative of reference stand structures and resilient under the foreseeable climate would occur with this alternative and more areas would be maintained at a structure and composition that is not expected to be resilient with long term climate change projections.

Alternative 5

With this alternative, treatments are designed to push species composition and structure toward reference stand structures and resilient conditions under the foreseeable climate. It is expected that increased treatment intensity in areas will reduce the potential for carbon loss in sufficiently treated stands.

Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101) Long and short term effects of project activities under each alternative considered in detail are described in the effects section specific to each resource.

Unavoidable Adverse Effects

Increased risk of dispersal and mortality of sensitive wildlife species and damage and mortality of sensitive plant species from project activities may occur in the short term. Additionally, increased potential for spread of noxious weeds, increased soil disturbance within treatment units and increased risk of cumulative watershed effects are all unavoidable effects for all action alternatives. These effects are discussed in detail in the Chapter 3 for each specific resource. Although short-term adverse effects are unavoidable with project implementation no significant adverse effects are expected to result from project activities.

Irreversible and Irretrievable Commitments of Resources _____

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

No other irreversible commitments of resources are anticipated. Construction of less than one mile extension of road under Alternatives 1, 4, and 5 represents irretrievable commitments for the time period that the road is used. Temporary road construction under Alternatives 1, 3, 4 and 5 represent irretrievable commitments for the period of time the roads are used, although temporary roads would be decommissioned following use, restoring the productivity of the site. Compaction associated with tractor harvest and mastication is an irretrievable commitment of soil resources that would ameliorate with time. The levels of compaction anticipated are within the LRMP standards and guidelines.

Legal and Regulatory Compliance_____

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders." The proposed action and alternatives must comply with following:

Principle Environmental Laws

The following laws contain requirements for protection of the environment that apply to the proposed action and alternatives:

Endangered Species Act

Refer to Botany, Terrestrial Wildlife, and Aquatic Wildlife Effects Sections

Clean Water Act

Refer to Water Quality/Hydrology Effects Section

Clean Air Act

Refer to Air Quality Effects Section

National Historic Preservation Act

Refer to Air Quality Effects Section

National Forest Management Act

All project alternatives meet requirements for the National Forest Management act through compliance with the 1989 Eldorado Forest Plan as amended by the 2004 SNFPA. Alternative 5 would require a site specific forest plan amendment for canopy cover and basal area retention defined in the 2004 SNFPA. Analysis of threats to Threatened, Endangered, and Sensitive wildlife and plant species were disclosed and the preferred alternative would not lead to a trend for threatening viability in the Forest planning area.

Executive Orders

The following executive orders provide direction to federal agencies that apply to the proposed action and alternatives:

Indian Sacred Sites, Executive Order 13007 of May 24, 1996

See Cultural Resources Effects Section

Invasive Species, Executive Order 13112 of February 3, 1999

See Botany Effects Section

Recreational Fisheries, Executive Order 12962 of June 6, 1995

Fish and wildlife on the Eldorado National Forest are managed by the State of California Fish and Wildlife Service while habitat is managed by the Forest Service. Affects to aquatic habitat are discussed in the Aquatic Wildlife Effects Section. The Rubicon River was designated by the State of California as a wild trout river from Hell Hole Dam to Ralston Afterbay in 1979. Maintenance of the wild and scenic river eligibility of the Rubicon River for trout and achievement of riparian conservation objectives for streams is expected to maintain habitat for recreational fisheries within the project area. Collaboration with members from Trout Unlimited occurred on this project to identify potential negative impacts to recreational fisheries and opportunities for enhancement of recreational fisheries habitat. Further discussion of Recreational Fisheries is included in the aquatic wildlife report (Grasso, 2013).

Migratory Birds, Executive Order 13186 of January 10, 2001

A migratory bird report was developed for the project. No negative effects to migratory birds are expected to result from project activities under any alternative (Funari 2013b)

Environmental Justice, Executive Order 12898 of February 11, 1994

Environmental Justice is discussed in the Socio-Economic Effects Section. This project would not disproportionately affect minority or impoverished persons.

Use of Off-Road Vehicles, Executive Order 11644, February 8, 1972

Through compliance with the Wheeled Motorized Travel Management Final Environmental Impact Statement (FEIS) (2008)

Special Area Designations

The selected alternative will need to comply with laws, regulations and policies that pertain to the following special areas:

Wild and Scenic Rivers

- The Rubicon River was determined eligible for designation as a Wild and Scenic River for trout and was recommended for designation by Congress in the 1988 Eldorado National Forest Land and Resource Management Plan. Although this area is not currently federally designated, Project activities would not compromise the ability of the river to be adopted as Wild and Scenic by Congress (Aquatic Wildlife BE, Grasso, 2013).

Chapter 4. Consultation and Coordination

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

ID Team Members:

Dana Walsh; Don Errington; Brian Ebert; Dorit Buckley; Claudia Funari; Rob Grasso; Eric Nicita; Jeff O'Connell; Becky Estes; Sue Norman; Tim Tolley; Terri Walsh;

Federal, State, and Local Agencies:

Environmental Protection Agency; Placer County Water Agency;

Tribes:

Miwok Tribe of El Dorado Rancheria; Washoe Tribe of Nevada and California; El Dorado Indian Council; Colfax-Todd Valley Consolidated Tribe; Shingle Springs Rancheria; Todd Valley Miwok Maidu Cultural Foundation; and United Auburn Indian Community;

Others:

Sierra Pacific Industries; California Forestry Association; Sierra Forest Legacy; Pacific Southwest Research Station; Eldorado California spotted owl Demography Study, University of Wisconsin; Mason, Bruce and Girard;

Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to the following Federal agencies, federally recognized tribes, State and local governments, and organizations: [Insert names of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved and any appropriate Federal, State. or local agency authorized to develop and enforce environmental standards; any person, organization, or agency requesting the entire environmental impact statement; and in the case of a final environmental impact statement any person, organization, or agency which submitted substantive comments.]

Glossary of Common Terms

BA	Biological Assessment
BE	Biological Evaluation
BMP	Best Management Practices
CFR	Code of Federal Regulations
CWA	Clean Water Act
CWE	Cumulative Watershed Effect
District	Georgetown Ranger District
EIS	Environmental Impact Statement
EHR	Erosion Hazard Rating
ENF	Eldorado National Forest
ESA	Endangered Species Act
Forest	Eldorado National Forest
Forest Plan	Eldorado National Forest Land and Resource Management Plan
FWS	United States Fish and Wildlife Service
HQ	Hazard Quotient
HRCA	Home Range Core Area
LOEL	Lowest Observable Effects Level
LOP	Limited Operating Period
MDM&B	Mount Diablo Meridian and Base
MIS	Management Indicator Species
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NOEC	No Observable Effects Concentration
NOS	Normal Operating Season
OHV	Off Highway Vehicle
PAC	Protected Activity Center
PCT	Pre-Commercial Thinning
RCA	Riparian Conservation Area
RCO	Riparian Conservation Objectives
ROD	Record of Decision
SNFPA	Sierra Nevada Forest Plan Amendment
SPLATs	Strategically Placed Landscape Area Treatments
TOC	Threshold of Concern
USDA	United States Department of Agriculture

Index

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Appendices

A. Unit prescriptions and maps

B. Best Management Practices

C. Cumulative Effects